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ABSTRACT

This activity packet produced by the Shell Oil Company, United Kingdom, addresses the environmental issue of waste. The packet is comprised of three booklets: Notes for Teachers; Student Activities; and a student story book, Trouble at Deetown. The teacher section provides teaching suggestions corresponding to the student sections and a glossary of terms. The student activity section describes 27 learning activities divided into categories: (1) what is waste; (2) waste in school; (3) waste in the home; (4) waste in industry; and (5) waste and the environment. The cross-curricular activities are designed to encourage students to develop their personal definition of 'waste' utilizing a wide range of skills and to support the development of economic awareness. The student story book introduces litter awareness: havoc is created when a small town road-sweeper misses a few days of work due to illness. Suggestions found in the teachers notes are correlated to the 27 student activities, and a chart is provided to assist in cross-curricular planning. (MCO)

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What a WASTE!

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Shell Education Service

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Foreword

Young people today are bombarded with messages about the economy of whic! they are part. Habits and attitudes are formed from an early age – at home from parents, with and from friends, at school and through the media. This pack invites 10 – 14 year olds to work with each other and with their teachers to think carefully about the security of the environment in which they live and about the implications of the ways tney and others use the economic resources at their disposal. The theme chosen for the activities, projects and enquiries which comprise the pack is INVESTIGATING WASTE arguably a vital issue in a society branded by many commentators as "throwaway'.

A pupil's entitlement to the knowledge, understanding and skills that permit habits, attitudes and judgements on economic matters to be subjected to scrutiny is no longer in question. Economic Awareness is now a designated theme in the National Curriculum in England, Wales and N. Ireland and is an aspect of the curriculum guidelines for schools in Scotland. Pupils have a right to develop their thinking on economic issues. The preparation of these materials in Lincolnshire schools shows that Economic Awareness is part of their educational agenda. The sponsorship of the pack by Shell UK demonstrates one large company's proper concern for its joint long term responsibilities with education towards a secure environment and economic well being.

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Book 1. **Notes for Teacher**

Book 2. **Student Activities 1-27**

Book 3. **Trouble at Deetown (A Story Book)**

Steve Hodkinson

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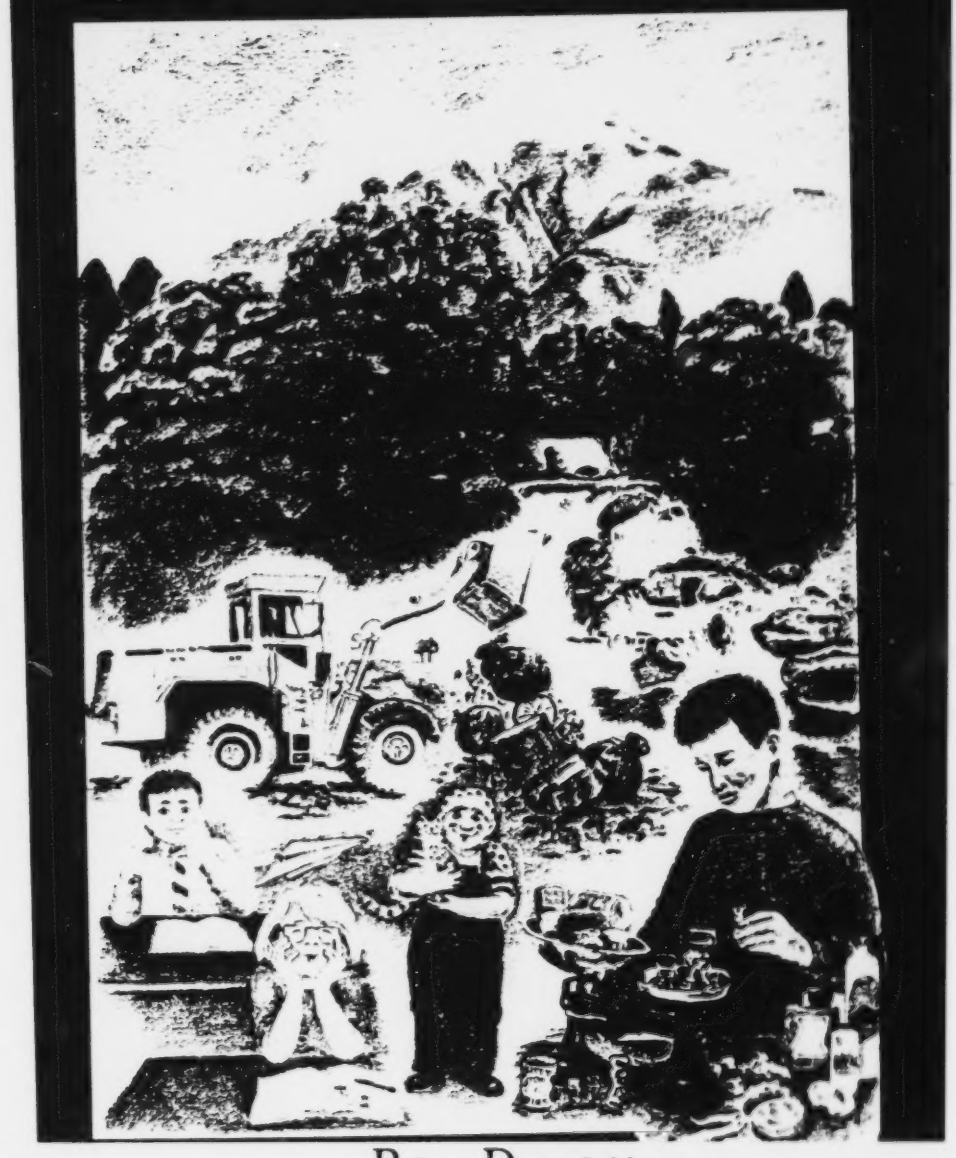
NOTES for TEACHERS

What a WASTE!



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NOTES FOR TEACHERS

Investigating waste

Waste is an ideal subject for students to investigate. The 'raw material' is all around them... at school, at home, in the streets, everywhere, and the investigation, besides being instructive in itself, leads to the consideration of wider economic issues.

What is 'waste'?

Students are first encouraged to work out their own definition of 'waste'. To do this, they have to learn how waste is created, and why. They are soon brought up against the fact that waste is everyone's responsibility because everyone helps to create it. Waste is partly caused by thoughtlessness, of course, and to that extent it is a moral problem, as it always has been. However, our current economic system is capable of producing far more waste than ever before. Waste is a problem of that system.

What is the 'economic system'?

A paper published by the Manpower Services Commission entitled 'Economic Awareness Across the Curriculum' gives this definition: "Individuals, industrial, commercial and other groups in a country as well as national and international communities make decisions about the use of resources. Together their decisions create the institutions, habits, values and constraints which in turn influence individual and group behaviour and decisions and which comprise the economic system."

In other words, an economic system (in a free society) is the sum of countless separate decisions. Decisions relating to the creation, disposal and use of waste are typical examples. By investigating them, students will have a better understanding of how an economic system works. They will gain in 'economic awareness'.

Cross-curricular

The Activities described in this pack are designed to be cross-curricular and encourage students to use a wide range of skills. They can be used 'as they are' or adapted by teachers to meet their requirements. Students should be encouraged to use the glossary of terms whenever they have difficulty with words used in the text.

The Activities lend themselves to group work, but the choice of working arrangement is for the teacher to make. Each Activity should be introduced by the teacher and debriefed at its conclusion.

The Activities as a whole are specifically intended to support the development of economic awareness as a cross-curricular theme at Key Stages 2 and 3. Many of the Activities fit readily into the three core curriculum areas of English, Maths and Science as well as additional areas including Design and Technology, and Geography. The chart on page 18 will help teachers to map cross-curricular planning in relation to Activities used from this pack.

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The trial schools

The worksheets in the pack were developed at Cliffedale School in Grantham. The Activities were then trialled and used with a number of other schools on students in the 10 – 14 age range. The target market for the pack is the upper age range of primary schools and lower age range of secondary schools.

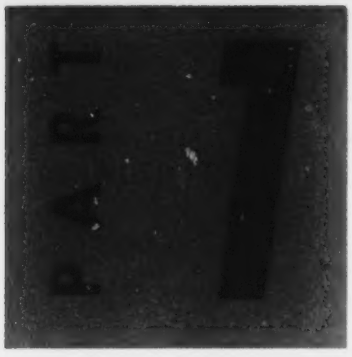
The Activities

The Activities build outwards from the school and home to the local environment, before touching on wider issues.

The students' sections comprise:

Book 2: Activities for investigating waste
- Part 1: What is Waste?
- Part 2: Waste in the school
- Part 3: Waste in the home
- Part 4: Waste and industry
- Part 5: Waste and the environment

Book 3: Trouble at Deetown – a story book



Activity 1

WHAT IS WASTE?

This Activity sets the scene for the rest of the pack. Students are asked to say what they think is meant by the word 'waste' and to discuss it with others in small group work. The groups' definitions should be recorded, and perhaps displayed in a prominent place in the classroom.

The teacher should not try to intervene to structure a definition. The students will need to re-assess their initial definitions as they work through other activities in the pack.

Students will then be given the opportunity to illustrate and classify types of waste.

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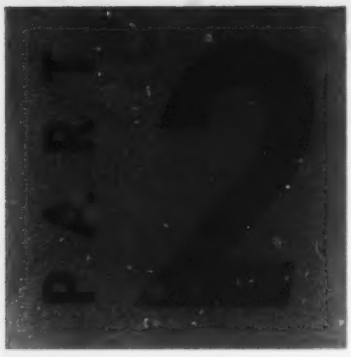

WASTE IN THE SCHOOL

Activity 2

This Activity involves direct classroom observation. Individual students or groups of students should be asked to watch the rest of the class going about some typical classroom work and assess their use of such assets as time, space, heating, lighting and classroom resources (including, for instance, paper). Finally, the 'watchers' should report on how efficiently – or wastefully – the assets were used.

Activity 3

Different groups within the class should be given the responsibility of collecting classroom waste products at different times of each school day.

Students will need to consider:

- How the waste products can be classified.
- How they can be quantified.

Students should also reflect on how the waste is produced, and who is responsible for producing it. An important consideration at this stage is whether the waste products are really 'waste' or not. They should find out who clears away the waste, and why, and consider what happens to it after it has left the classroom.

Activity 4

This Activity provides important insights into the way in which an organisation can plan for the effective disposal of waste. Studying the system of litter-bin planning has important implications for school management and for students' appreciation of systems.

Where are the litter-bins to be found in the school? How are they being used? Are they being used effectively? Could they be organised in a better way? Perhaps students could find out who was responsible for creating the existing patterns and the reasoning behind them.

The Activity should also bring home to students that *they* are the producers of litter. The creating of litter is a direct result of their carelessness with the packaging of the products they consume. Issues that could be touched on are: Why do we need packaging? Do we need so much packaging? What could the discarded packaging be used for? How important is it to manage litter? Who should be responsible for managing litter?

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Activity 5

An important part of this Activity is the report to the Head Teacher on suggestions and recommendations for reducing waste in the school. Schools need to make effective use of scarce resources and any savings should be channelled into worthwhile causes. An awareness of how the school allocates expenditure could form an important background to this exercise. Perhaps the Head Teacher could brief the class (or the whole school) on how much is spent on items like heat and light in a year. If lights can be turned off when a classroom is not in use, then the money could be spent on something else. Litter and untidiness in the classroom and around the school also cost money and time in clearing up. Buildings and equipment can be used more effectively if their value is appreciated.

WASTE IN THE HOME

Activity 6

Students are asked to consider their definitions of waste in the light of discussions with other members of their family. They should then keep a detailed record of all the things that are treated as waste in their home, and consider where these items (eg used packaging) or actions (eg turning on lights unnecessarily) are really 'wasteful' or not.

They should classify items of household waste into categories and try to explain how these different categories are created and how disposed of. They should then consider alternative ways of converting the waste into useful resources.

Activity 7

This is a simple graphical exercise that will make students aware of the vast amount of waste created in this country, and its composition. The teacher should decide whether students should carry out task 1 or task 2.

The teacher should try to obtain figures for the quantity and composition of waste produced locally over the past few years. The best source of information is the Environmental Health Department of the local council. Students can then identify any trends in the quantity and composition of waste.

Activity 8

Students will need to collect and wash domestic waste before bringing it into the classroom. Alternatively, the teacher could bring a sample.

The waste can be weighed on any form of scales, provided they are sturdy enough. The waste should then be categorised and the quantities in each category recorded in the 'table' provided.

The results should give only very approximate similarities with the overall national or even local picture. Every household is different. You are only dealing with samples, which may not be representative. Moreover, some household waste is difficult to handle in class.

Students should be asked to consider how the quantity of waste could be reduced, and why some categories of waste would be more difficult to reduce than others.

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Activity 9

This Activity will require a considerable amount of teacher support. The Activity should start with a class discussion on the subject of recycling. The teacher should be able to make an important input. However, students should also be given freedom to use their imaginations to think up alternative ways of recycling waste.

They should also be asked to draw a map showing the sites of local recycling facilities, such as bottle banks.

Activity 10

'Making clothes' is designed to encourage students to think about the way materials are used in clothing. Many fashion clothes have a very short life-span. Some are worn for a season before being banished to the recesses of wardrobes and drawers. Perhaps they will end up in the Oxfam shop or simply be thrown in the dustbin.

In this Activity, students are asked to collect waste cloth and paper as materials for making clothes. While students will get a lot of fun from making the clothes, it is important that they stick closely to the design brief and that the clothes are as well made as possible. Students should be encouraged to think about the qualities of fabrics and other materials. Do we have to stick rigidly to the 'conventional wisdom' about what are the suitable materials for people to wear? Is it possible to use alternative fabrics, using fewer scarce resources and have fun with our clothes at the same time?

Students need to explore the good and bad points of the Activity. Perhaps recycled fabrics are a waste of time and resources. Perhaps the materials could be better used for some other purpose. How else can we use discarded materials? Old newspapers, for instance, can be used for wrapping fish and chips – what can other waste materials be used for?

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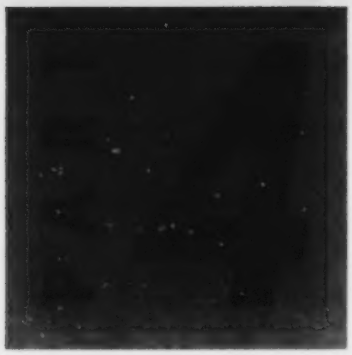

WASTE AND INDUSTRY

The Activities in Part 3 concentrate on waste in the home and encourage, among other things, an awareness of the fact that we are all producers of waste. Part 4 takes students a stage further and invites them to consider how 'their' waste is dealt with, and to consider what happens to it after their bin is collected.

The organisation responsible for handling domestic waste in the area could be contacted to see if they would be willing to help the school in this work. Such help could initially take the form of a visit to the school by some of that organisation's employees to inform students about their work.

Possible developments could be:

1 An introductory talk by the teacher or an outside specialist. This talk could cover, for example, how the waste is collected, who collects it, what special equipment is used, where it is taken, how processed, and any aspect of the overall handling process.

2 A follow-up visit to a waste-disposal site eg a landfill.

3 A demonstration by an outside specialist of waste-handling equipment (either actual or on video/slide).

Each of these events will involve the students directly, provide relevant experience of waste-handling, and stimulate questions and discussion.

Representatives of local waste-handling organisations can be asked to visit the school and tell students about the industry and its aims and problems. A study of how such an organisation works can be a useful aspect of the general investigation into waste.

The early Activities in this section ask students to consider the reasons for packaging, its costs and benefits.

The Activities that follow involve the study of:

i) an organisation involved with recycling

ii) an organisation involved with waste-disposal

Students should carry out some preparatory work before the investigation takes place. They will need to be given background information about the organisation and instructed in the art of report writing.

Further Activities involve the design and construction of working models of a waste-compactor and a litter-collector.

Note: When an industrial visit is to take place, it is essential that the teacher visits the company first to discuss the objectives of the visit. After the visit, students should always write a letter of thanks. The teacher should debrief Activities both with the students and with any companies that have helped.

Activity 11

Packaging is a large and important industry. In 1986 for example, £5.3 billion was spent by manufacturers on packaging.

Most of the food we eat comes out of a pack of some kind. In fact many of the food products we take for granted could not be bought unless they *were* packed. Liquid soup, for instance, can only be sold in cans; milk can only be sold in bottles or special cardboard packs – the days when housewives took jugs to the local dairyman are long gone.

Students can be asked to make a list of all the foods they can think of that are packaged.

Packaging is not only used for food. Many of the other products in the shops are packaged. For instance, we buy shampoo in a bottle, tissues in a box, books in jackets, TV and other electronic goods in strong cardboard containers.

Packaging is needed for many reasons. It protects and preserves products and prevents wasteful spoilage. It tells customers what they are buying. It also makes it easier to 'dispense' the product at home.

The word 'packaging' needs explaining. It can mean the *physical* pack, box, can or bottle containing the product. Clearly some sort of packaging in this sense of the word is *always* necessary.

The word 'packaging' is also used to describe the 'surface design' on the pack, box, can or bottle. The surface design contains information about the contents. It often adds 'promotional' claims about the product.

The information given in a product's surface design has to satisfy a great many legal requirements. For instance, in many product areas, it must give a full, accurate list of ingredients. It must not mislead in any way.

The benefits of the 'physical' packaging can be summed up as follows:

- It contains the product (eg a milk bottle).
- It protects it from all kinds of damage and in this way prevents waste.
- It ensures the safety and hygiene of food, toiletries and medical products.
- It preserves the product's quality.
- It stops people tampering with the product.
- It can reduce transport and storage costs (eg properly packaged electronic goods can be piled higher in trucks and on storage shelves).

The benefits of the packaging's surface design can be summed up as follows:

- It tells buyers about the product.
- It helps people to choose.
- It makes 'self-service' possible (and therefore saves time and effort, and reduces costs).

- It makes shopping more fun.
- It persuades more people to buy the product and so helps to keep costs down.

The drawbacks of packaging, both the 'physical' packaging and the surface design, are:

- It can be expensive.
- It can use scarce materials.
- It can add to transport costs.
- It can confuse shoppers.
- It might encourage people to buy more than they should.
- It helps create litter and waste.

Students should be made aware of packaging as an industry in its own right. Most towns contain at least one packaging company. It may be worth a visit. Alternatively, the teacher may be able to borrow samples of packaging that have been made locally or bought-in by a local company.

Students should be encouraged to evaluate any available packaging – what is its purpose? Is it achieving that purpose? What are its good and bad points?

Bringing products to customers

The Activity is also designed to create awareness of the way in which the 'economic system' creates products and brings products to customers, often from thousands of miles away.

Students will need maps – an outline world map or a map of the British Isles – to help them locate the sources of the ten items they are asked to bring to school.

This part of the Activity will help students to understand that some of the things we buy cannot be produced in this country at all, or cannot be produced cost-effectively. We can't grow bananas or other tropical produce in Britain. Other items, such as electronic components, are more cost-effectively produced in one country than another. There is also the complication that many products are made up of materials from several countries. A car assembled in Sweden may contain many important components made in the UK.

Activity 12

This Activity uses a bubble gum packet as a focus for an investigation of the relationship between packaging and contents. Quantitative comparisons can be made between the weights of packages and their contents and between relative 'appearing' size. Is it necessary to have so much packaging? Does packaging enhance or distort consumer choice?

The Activity encourages students to appreciate different perspectives on packaging. Some people may regard packaging as a waste because they believe it uses too many scarce resources

unnecessarily, increases prices, confuses customers and causes litter. Others see packaging as a necessity of a modern society because it protects products at all stages of their journey from the producer to the end-user. For instance, with many foods, legally required standards of purity and quality cannot be maintained without modern packaging. Packaging also makes self-service possible (thus reducing costs). It tells the buyer what the product is made from and gives other useful information (such as recipes, or safety precautions). Finally, it adds colour and excitement to shopping.

Students should be encouraged to bring a range of packaging into the classroom. A discussion can then take place on the merits and drawbacks of different forms of packaging.

Activity 13

This Activity introduces some simple mathematics using 'nets' of boxes. Students will require card, scissors and glue.

Students will need to bring examples of packaging into the class. They can then relate this exercise to real world applications. They will also get a clearer idea of how to construct an effective piece of packaging.

Students are asked to create a surface design for their boxes, perhaps by 'personalising' them with their own names, the name of the school with local details and illustrations. The boxes can then be displayed in the classroom. This Activity is very suitable for students who have only recently moved into a new classroom. With *their* boxes decorating the room, students have a greater feeling of 'ownership'.

Activity 14

Students are asked to produce a package for a pyramid-shaped chocolate. Once again, they are required to use their mathematical understanding in the design process. This time they are producing a commercial product. They will need to consider elements such as use of lettering, image and creation of brand names.

The packaging will need to meet a number of important requirements. It should:

a protect the contents.
b be easy to open.
c give relevant information.
d help buyers identify the contents.
e be easy to produce in quantity.
f be bright and eye-catching.
g be cost-effective, particularly in its use of resources.
h ideally be easily recyclable.
i be easily carried, transported and stored.

Students are asked: Who decides whether the packaging is *good* packaging? This should help them to appreciate that packaging needs to be 'good for' several different groups of people:

Producers need packaging that is cost-effective... that protects the products during transport and storage... and that appeals to the customer.

Distributors (wholesalers, retailers and anyone else responsible for transport and storage) need packaging that is easy to handle and not easily damaged.

Customers want packaging that tells them what they are buying, gives relevant information, is easy to carry, open, use and store, and that continues to keep the product in good condition.

Activity 15

This Activity is designed to help students make sense of an industrial visit. Before the visit takes place, they will need to be thoroughly briefed on the objectives.

Students will need background information about what the firm produces – its outputs. Outputs should not be considered simply in terms of the end product sold to customers. There are other outputs. Companies pay wages and provide other benefits to their employees; they pay taxes and business rates to national and local government; they reinvest profits in their business; and they pay dividends to shareholders – pension funds, insurance companies and individuals. Companies may also sponsor local activities and be involved in community projects. All these are 'outputs' in the broadest sense of the term.

Companies also need inputs. The word covers far more than simply 'raw materials'. Most important of all are the inputs provided by *people*, their skills, enterprise and loyalty. In addition companies benefit from the services provided for everybody by local and central government – such as the road network, street lighting and refuse collection.

The processes that take place within the company go beyond the physical or chemical transformation of raw materials into products. To make sure that those processes are carried out efficiently, the people involved are constantly taking decisions, either individually or in teams.

Some of the physical/chemical processes may be too complex for students to understand. The teacher should make a preliminary visit to clarify how best to brief the students in advance – and to decide which processes to concentrate on.

Once students have been briefed about what they will see, they should be helped to think up appropriate sets of questions – and explain how they think their questions will be useful.

Some suggested questions are given in the notes for this Activity.

Activity 16

This Activity complements the previous one. An input and output diagram will help students to understand ways in which a business organisation operates. Students should be encouraged to structure the diagram to incorporate as wide a range of inputs and outputs as they can.

Activity 17

This Activity gives detailed planning instructions for designing a model of a waste-compactor. However, these instructions can easily be adapted for any piece of recycling equipment. Students are asked to work in groups.

They will need to think up their own ideas before sharing them. By carefully following the instructions, groups should be able to produce effective working models.

Materials recommended for this Activity are balsa wood, offcuts of builders' softwoods and any other available light woods. A softwood pack can be bought for about £5 with enough wood to meet the needs of a class of 30 students.

Today it is common practice to use methods recommended by David Jinks and Pat Williams (Design and Technology 5-12 Falmer Press) for building models in the classroom using PVA (Marvin) glue, card and softwood. Desks can be protected by offcuts of formica or by bench hooks.

Students will require the following tools and materials: Stanley knives, junior hacksaws, hammers, nails, offcuts of card and wood, screwdrivers and screws.

The planning instructions in Activity 17 can readily be adapted for Activity 20.

Activity 18

This is a follow-up Activity to the previous one. Students should be encouraged to think about the processes they went through in developing a completed model.

By carrying out this Activity, students should learn some useful lessons about the planning process... what methods can be employed... what were the good and bad points about the tools and materials they used... how did the students record the progress of their model-building... how did the group work together... what are the advantages and disadvantages of working in a group.

Activity 19

This Activity asks students to consider what happens to the waste that goes into their dustbin... who deals with it... what happens to it... is it 'managed' effectively... are there alternative methods of managing waste.

When dealing with the issue of landfill, it is important to consider all aspects of the problem. Landfills can only be used with local authority consent. An organisation using landfill can be asked to come to the school and explain the benefits and drawbacks.

Activity 20

This Activity involves the design and manufacture of a model of a litter-collector. The design brief used in Activity 17 will give students a helpful framework.

Students should be encouraged to recycle leftover items from their home to help in this exercise. At Cliffedale School, one excellent model of recycling equipment was produced using a broken pushchair base.

The planning stage is crucial. Students should be encouraged

to evaluate and modify original drawings to make sure that the end product *works*. Some designs that look good on paper, or when described verbally, are often unmakeable.

Activity 21

Writing a letter of thanks is standard good practice – and good manners. Writing the letter encourages composition skills as well as fostering good relations between the school and the outside organisation concerned. Students should be encouraged to give any organisation visited some sort of 'feedback', including the good and the bad points about the visit. This helps the organisation to assess its own arrangements and generally helps to improve the effectiveness of the links between the school and the outside world.

WASTE AND THE ENVIRONMENT

Activity 22

This Activity helps to draw attention to many different kinds of waste, including waste of time, effort, space, materials and resources generally. The Activity can be used to stimulate discussion in a range of curriculum areas – business studies, maths, science, art, design and technology and others too.

The Activity has also been used as an all-staff training exercise for introducing teachers to the contents of the pack.

Activity 23

This Activity contains a great deal of information. Teachers will need to brief students at length before they start. They should be made aware of the nature of the issue, who is involved, and ways of dealing with it.

Each student should be given a copy of the map, background information and suggestions for dealing with the problem. In addition, small groups of students should be given copies of each of the role cards.

The teacher should then select members of the group to play the key parts at the tribunal.

The meeting should be run by the three panel members. It is suggested that the teacher plays the part of one of the panel members. The role-play works best if students act out the tribunal wearing appropriate clothes:

gowns for the panel members;
towels around the swimmers' shoulders (perhaps bathing caps on their heads);
the safety officer should wear smart formal clothes;
the farmer should wear an outdoor coat;
so should the farm manager;
the National Rivers Authority representative could wear a white coat, and perhaps have a sample of river water in a bottle;
the fishermen could wear woolly hats, and carry fishing rods;
the mayor could wear a gown with a mayoral-type chain;
the chairman of the meeting should have a gavel and a block of wood to hit.

The meeting can be given an added air of realism by asking an 'adult other than teacher' to conduct the meeting. In trial runs, the clerk of the local council came and chaired the meeting. This made it more fun, more realistic and more efficient.

The central part of the Activity involves the acting out of the

case study. The panel will then need to go into a short recess before presenting their recommendations. How the meeting goes depends on the enthusiasm of those taking part, and the amount of preparation they did.

Once the case has been acted out, each student taking part should produce a written report of the incident and its aftermath. In their reports, the students should state:

'who they thought responsible'
'what should be done to make sure that the problem doesn't happen again'.

The teacher should debrief the exercise at length to assess what went right, and what could have gone better, and also to ensure that the students have gained a deeper insight into the problems presented by pollution and its prevention.

Activity 24

It is suggested that this Activity is carried out with the help of two full-colour wallcharts, available from the Shell Education Service. They are:

1) A pond food web
2) A woodland food web.

Students should also be given some brief background information about Acid Rain (see glossary).

Students are asked to record their thoughts about the relationship between waste pollution and food webs. The Activity attempts to create an awareness of the issues involved and encourages students to ask questions. A detailed scientific investigation is inappropriate at this stage.

Activity 25

Students are presented with two writing tasks. The topics for discussion generate a great deal of interest. Students are encouraged to use their imagination to consider a world without waste management – and how an alien from another world would view the waste we create.

These activities can either be tackled as straight writing exercises or produced in the form of a cartoon strip.

Activity 26

This Activity asks students to imagine that they are stranded on an island off the coast of Scotland. Cans thrown away by holidaymakers and some discarded tools in a workman's hut become their 'scarce resources'.

Students are first asked to think of as many items as possible that could be made from the cans. They could be asked to produce some of these items from cans brought from home.

Students are then told that they only have a limited number of cans available and they have to decide which possible uses for the cans are worth pursuing and which are not worth pursuing. Different ways of reaching the best decisions can be explored. For instance, is it better to appoint one person as a leader and make

that person responsible for the final decision? Is it better to have a vote, with everyone taking part? Should the students who are best at making things have the final word?

The students should be asked to assess which method is the fairest, which the most efficient, and which the quickest.

Activity 27

First the students are asked to read 'Trouble at Deetown'. Then they have to answer a number of questions. Later they could be asked to produce a children's story of their own on the subject of waste.

Perhaps they will want to set up their own 'Waste Watch' scheme. Further information can be obtained from 'Waste Watch' organised by the National Council for Voluntary Organisations and sponsored by Shell UK and the Department of the Environment.

CROSS CURRICULUM PLANNING/RECORD FOR A UNIT OF WORK ON			CLASS	MONTH(S) SCHOOL YEAR			
ACTIVITY	ORGANISATION	CURRICULUM AREA(S)	EXPERIENCE PROVIDED FOR ATTAINMENT TARGETS:				COMMENTS
			MATHS	SCIENCE	ENGLISH	OTHER	

GLOSSARY OF TERMS

Acid Rain

Acids converted from sulphur dioxide, nitrogen oxides and other pollutants and deposited on the ground not only with rain but with snow and fog too. Acid rain is better described as acid deposition. Governments are now imposing strict limits on the emission of these pollutants.

Bar Chart

A diagram that represents different quantities with bars whose relative sizes correspond to the relative size of the quantities being discussed.

Bottle Banks

Large containers, conveniently located, into which people can put their empty bottles for recycling. Ideally, there should be separate receptacles for brown, green and clear bottles. Bottle tops and stoppers must be removed before bottles are banked.

Can Banks

Large containers, conveniently located, into which people can put their empty tins or cans. Cans made of steel should be kept separate from those made of aluminium (How can you tell the difference? Aluminium isn't attracted to a magnet.)

Chlorofluorocarbons (CFCs)

CFCs are man-made compounds used in aerosols, foam plastics, refrigerants, cleaning agents for electronic equipment and fire extinguishers – now judged to be a cause of depletion in the ozone layer and a contributor to the greenhouse effect. Production and use of CFCs are now in the process of being phased out.

Consumer

A word used to describe the person who actually uses a product or service, sometimes known as the 'end-user'. For instance, the consumer or end-user of a hamburger is the person who eats it; the consumer or end-user of a pair of jeans is the person who wears them.

Domestic Waste

Everything that is thrown away in the home. It includes: paper and cardboard, bottles and cans, plastic containers, old clothes and food scraps.

Environment

Everything around us, natural or man-made.

Finite Resources

Finite resources are natural resources whose total availability can be estimated and which, once used, cannot be replaced. Examples of finite resources include fossil fuels and minerals. However, although finite resources cannot be replaced, the products made from some of them can be recycled. For instance, aluminium made from the mineral bauxite, which is available only in finite quantities, can be recycled almost endlessly.

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Food Chain

(Sometimes called a food web). The chain of dependency between species. A food chain contains at least three organisms, one of them a green plant.

'Greenhouse' Effect

Carbon dioxide in the atmosphere acts like the glass in a greenhouse. It allows ultra-violet and visible radiation from the sun to reach the earth but traps part of the infra-red energy that is radiated back. Increases in the amount of carbon dioxide in the atmosphere (largely because of fossil fuel combustion and of deforestation) may increase the amount of infra-red energy trapped. Increases in the amount of other 'greenhouse' gases, notably the chlorofluorocarbons, add to the problem. As a result, world temperatures may rise. There is considerable uncertainty about the potential risks. However, it is clearly prudent to take precautionary actions that are useful in their own right, such as energy conservation.

Halons

Halons are man-made compounds used in fire extinguishers. They contain bromine, now judged to be a cause of depletion in the ozone layer.

Input

Input is what goes into a company or any other kind of organisation in order to produce output. For instance, the input of a factory making cars includes metal, rubber and plastics. It also includes the skills of the people who work in the factory. A broader definition of 'input' would cover, in addition, the skills and work of the people who built the factory in the first place.

Landfill

Landfill is a method of disposing of waste by burying it in the ground, often in a disused quarry. When full, these sites can be covered with earth and used for other purposes, such as industry and leisure activities. About 60% of domestic waste in the European Community goes into landfill sites (33% is incinerated; 7% re-cycled).

Litter

Paper, plastics, glass or other materials left lying about in public places.

Needs

The basic human needs are food, clothing and shelter.

Net

The shape of a box or carton when it is laid out flat.

Organic Matter

Organic matter in the 'waste stream' consists mainly of food scraps and vegetable waste (eg potato peelings).

Output

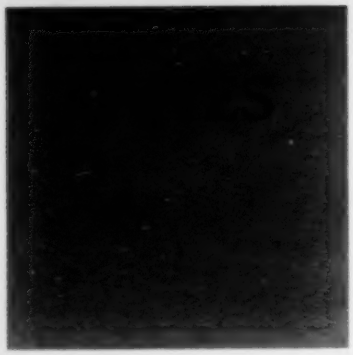
Output is what comes out of a company or any other organisation as its end product. The end product includes the actual products the company wants to sell. It also includes the wages and salaries paid to employees.

Ozone Layer

The ozone layer, located some 15-20 kilometres above the earth's surface, shields the earth from the sun's ultra-violet radiation. It is now reasonably well established that depletion of the ozone layer is caused by the emissions of certain man-made chemicals, such as CFCs and halons. Production and use of these chemicals are now in the process of being phased out.

Packaging	Materials, often in the form of boxes or cartons used to protect products and promote their purchase and use.
Pie Chart	A circle divided into segments that represent different percentages of a whole.
Pollution	Pollution means, literally, contamination with poisonous or otherwise harmful substances. The practices and technologies needed to reduce if not eliminate most forms of pollution are being constantly improved – and increasingly used.
Air Pollution	The main pollutants are: sulphur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide and volatile organic compounds. Nearly all these pollutants are created by the combustion of fossil fuels. They contribute to the formation of 'smog', 'acid rain', the 'greenhouse effect' and, with CFCs, to a possible reduction in the ozone layer.
Water Pollution	The main pollutants are sewage and industrial effluents (such as chemical 'wastes') and oil leaks from tankers and off-shore exploration and production.
Soil Pollution	The main pollutants are: seepage from landfills and the residues of agricultural chemicals.
Noise Pollution	This is largely a subjective concept – one person's noise is another person's pleasure – and best handled by simple courtesy. However, some noise is physically painful, even damaging (eg the noise from a road drill).
Recycling	Processing a material so that it can be used again either for its original purpose or for a different purpose.
Renewable Resources	Renewable resources are natural resources that can either be 'renewed' (such as biomass or livestock) or are not depleted however much they are used (such as wind or wave power).
Slurry	A suspension of solid particles in liquid. For example, coal slurry is coal particles suspended in water; agricultural slurry is usually a mixture of mud and farm waste products, including dung and urine.
Waste	Waste is something you don't need and can't think of a use for. Since practically anything has some kind of a use for something or someone, it follows that 'waste' is a highly subjective word – 'one person's waste is another person's want'.
Waste Management	Any systematic method of handling waste and disposing of it. The sewage system, based on treatment plants, is an example of waste management.
Waste Stream	Term used to describe the flow of waste from the creator of the waste to its final disposal by burial, incineration or re-cycling.

NOTES



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STUDENT ACTIVITIES

What a WASTE!

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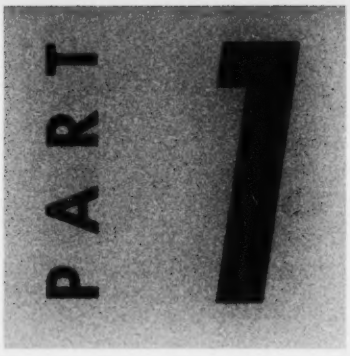


WHAT IS WASTE?

We use the word 'waste' every day.
We say things like:
"I'm not going to waste my time doing that"
or
"That's a waste of good food"
or
"You're wasting your energy"
or
"That's just waste paper"
or
"I'm not going to waste my money on things I don't want"
or simply
"What a waste!"

What exactly do we mean by 'waste'? We frequently use the word, but we use it to mean different things at different times.
The activities in this pack have been written to help you think about the whole question of waste and to explore your own ideas as well as those of other people.

Remember when you tackle these Activities ... different people will have different ideas about 'waste'. Other people often enjoy doing things that you think are a waste of time. They often buy things that you think are a waste of money.

By carrying out the activities in this pack, you should be able to think more clearly about:

- what you mean by waste
- what others mean by waste
- how to deal with waste.

Activity 1

What is waste?

1 Look at the word 'waste'. What does it mean to you? Write down what you think the word 'waste' means.

2 Now form a group with two or three others to swop your ideas. What have other people written? Are your ideas different or the same? Talk about them together.

3 As a group, try and write down a definition of 'waste' that you can all agree on. Try and write it as a single sentence.

4 Draw a picture under the heading 'waste' showing as many different types of waste as you can think of.

5 Can you group any of the types of 'waste' that you have mentioned into categories or lists?

WASTE IN THE SCHOOL

The four Activities in this section encourage you to look at and think about waste in your own school.

- What wasteful activities take place in your classroom?
- What waste products are created in the school day?
- What happens to the waste products of your school?
- Can litter be reduced within your school?
- How can it be reduced?

These are just some of the many questions which are looked at in this section of work.

In Activity Two, you will watch what is going on around you in the classroom to see if you can identify 'waste'.

Activity 2

Waste watching in the classroom

Sit quietly for five minutes and watch what is going on around you in the classroom. Make notes of what you see.

1 Can any of the things you see be described as wasteful? Make a list of them. Say why you think they are wasteful?

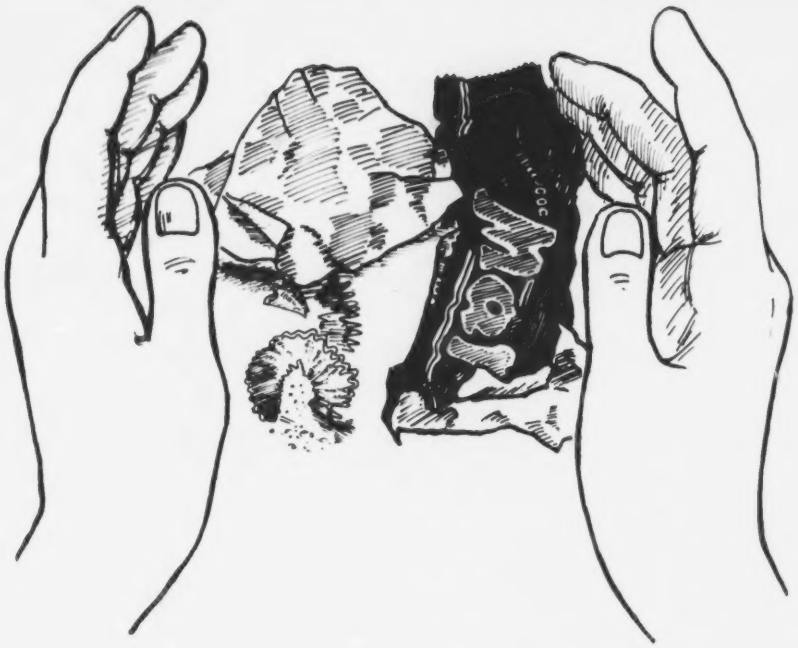
2 Could any of the wasteful behaviour or habits on your list be prevented?

3 Now look back at your definition of waste. Do you want to change it, or to include anything new?

4 Each group should now explain to the class:

- What wasteful activities they saw.
- How waste could be cut down.
- Whether they have changed their definition of waste.

Activity 3



For Activity Three, make sure that you keep the waste you collect in a safe place so that you can study it later.

Thinking about the waste products of your classroom

1 Collect all the waste products that are created in your classroom during a set time – this might be an hour, one morning, a whole day or even a week.

2 If there are different types of waste products, put them into separate containers.

3 Write a report about the types of waste products you have collected:

a Is it really all waste? (Look back at your definition of 'waste'.)

b How will you describe or measure the quantity of waste products you have collected?

c Who created the waste you collected?

d Who should be responsible for clearing it away?

e What will happen to the waste? Will different types of waste be treated differently?

Activity 4

Activity Four asks you to make a study of the way in which waste is dealt with in your school?

a Where are the litterbins?

b How well are they being used?

c Are they located in the best places? Are there better places?

d How could more people be encouraged to use them more often?

Litterbin survey

1 Is there a litterbin in your classroom? Is it in a good place?

2 Where are the litterbins in the rest of the school? Draw a plan showing the position of each one.

3 Are the litterbins being used? Measure the level of the litter in the bins each day (eg full, half full, one quarter full, empty). Are some bins being used and others ignored?

Could the positioning of the litterbins in your school be improved?

4 At the end of the school day, collect all the litter in the bins and put them into sacks. Now collect all the litter you see lying about which should have been put into the bins, but wasn't and put all that into sacks too.

You now have two piles of sacks, one lot containing litter from the bins, the other containing litter you've picked up. Which pile is bigger? Why?

5 What kind of litter is normally put into the litterbins? To find out, empty the bins at a convenient time, say at the end of each lunch break or at the end of school. Keep a record of the type of waste you collect. Use a table to record your results. Weigh each bin's contents in grams and kilograms.

Location of bin	Classification of contents eg paper, card, cans etc	Weight of contents

(To get more reliable results, carry out the survey more than once.)

a What were the major types of litter contained in the bins? Draw a pie chart to show the proportions.

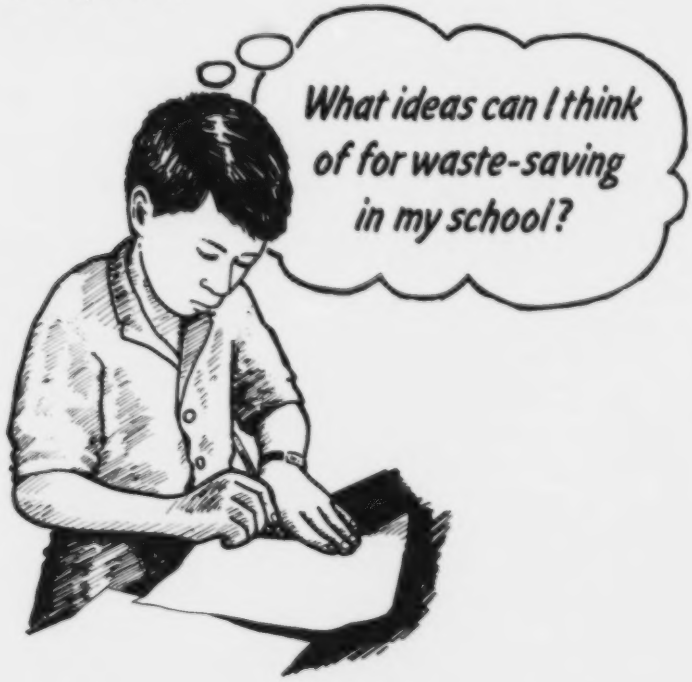
b Who produced the litter?

c What caused the litter? In other words, what materials were being used that produced the waste?

d Do these materials have to be used? Could you get through a school day without using them and creating waste as a result?

e What could we do with the litter in the bins? Can it be re-used in a sensible way? What do you suggest? What changes would have to take place to put your suggestions into practice? What would be the likely results?

Activity 5



In Activity Five, you are asked to identify the different types of waste that occur in your school and make suggestions for dealing with it.

Waste in your school

1 What type of waste can be seen and collected in your school?

Draw a table like the one below to record your observations.

Type of waste	Where you find it
Sweet wrappers	Playground
Food scraps	Dining room
Pencil sharpenings	Classrooms

2 Now look for examples of types of waste in the school which cannot be collected but which could be cut down or prevented.

Draw a table like the one below to record what you see.

Type of waste	Where you find it
Lights left on	Classrooms
Taps left on	Changing rooms

3 How could your school cut down on the amount of waste it creates?

Write down your ideas as a report to the Headteacher. In the report, say what types of waste you have noticed, and make suggestions for reducing the amounts.

a What are the possible benefits of your waste-saving suggestions?

b Who gets the benefits?

c What extra costs could your suggestions create? Would the benefits outweigh the costs?

d Would anyone lose out if your suggestions were carried out? How? Why?

WASTE IN THE HOME

Here are five Activities to help you think about waste in your home.

Many of the things that we do at home are so routine that we take them for granted. Once a pattern has been set, we rarely question it. Day after day we do the same things in the same way. This is particularly true of the way we think and act about waste. We often think that the way we deal with waste at home is the *only* way because it is the way we have always done it.

However, if you look at the way people thought and acted about waste in the past, you get a different picture altogether.

Fifty or sixty years ago, in the days before packaging became as popular and as possible as it is today, a typical family dustbin really was a *dustbin*. Its typical contents were dust and ashes, mainly from the open coal fire. The tins, cans, boxes, wrappers etc that we know so well today, and in such vast quantities, were hardly seen at all.

Try the Activities described in Part Three. They will help you to ask questions and think more clearly about the way in which waste is treated in your home.

Activity 6

Activity Six asks you to talk about your ideas about waste with other members of your family. You then need to identify and think about the types of waste in your home.

Waste in your home

1 Ask members of your family what they think the word 'waste' means. Are their definitions the same or different from those you wrote down at school? Discuss the definitions with members of your family.

2 Make a list of all the things that your family treats as 'waste' in an average week. Why do they think these things are 'waste'? Would they be waste to everybody else? Explain your answers.

3 Make a list of the different types or categories of waste produced by your family.

a What are the main categories?

b What causes the waste to be produced?

c What happens to it?

d How can the waste produced by your family be converted into something that is not waste'? Draw up a list of ten suggestions.

Activity 7

In Activity Seven, you are asked to draw a bar chart to show the make-up of household waste

What is household waste?

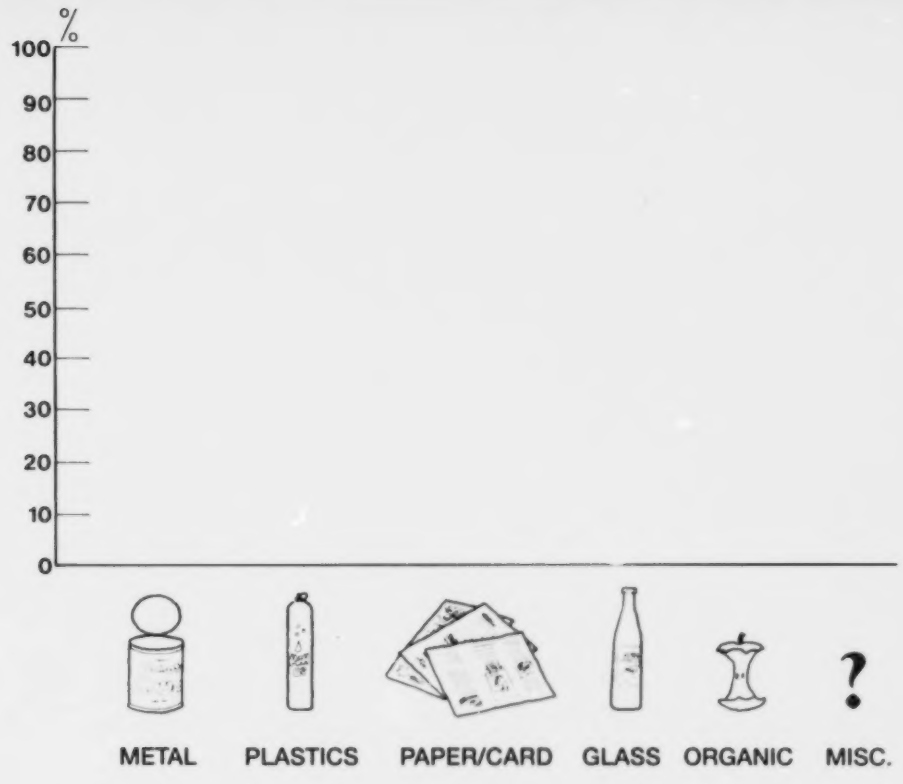
In 1986, Britain produced 56 million tons of household waste. It cost £720 million to dispose of it. Government research shows that a typical dustbin contains the following kinds of waste:

Type of material	% of dustbin content
Glass	10%
Paper and card	30%
Metal	10%
Organic matter (eg vegetable waste)	30%
Plastics	8%
Miscellaneous	12%

Using the figures given above, complete one of the following tasks:

1 Draw a bar chart to show the composition of household waste from a typical dustbin as a percentage figure (see outline graph on page 12).

2 Draw a chart to show the composition of household waste for the whole country as tons per year for each type of waste. This means that you will have to convert the percentage figures given above into tons (remember that the total figure for all household waste is 56 million tons).



3 Can you find any more recent percentages for different types of waste? Are the figures rising, falling or staying the same? Try and explain any change that you discover.

Activity 8

In Activity Eight, you are asked to weigh and categorise domestic waste. Be sure you always wear gloves while you are doing this Activity.

Investigating a sample of domestic waste

Carefully place a typical day's waste from your home in a black plastic bag. Be sure to wear gloves. The waste will include old newspapers, tin cans, scraps of food, glass and plastic bottles, and packaging made of paper and card.

1 First weigh the complete sample of waste. Record the weight using kilograms and grams.

2 Empty the sample on a table which you've first covered with old newspaper.

3 Sort the waste into different categories. You might find it best to sort the waste in the categories shown in the diagram.

4 Now weigh each separate category of waste. Record your results in the 'table' provided. (What should the total weight of all the separate categories of waste add up to?)

5 Now work out the weights of each category of waste as a percentage of the total weight of the waste sample. Use this formula:

$$\frac{\text{Weight of category of waste}}{\text{Total weight of waste sample}} \times \frac{100}{1} = \% \text{ weight}$$

6 Now draw a chart to show your results.

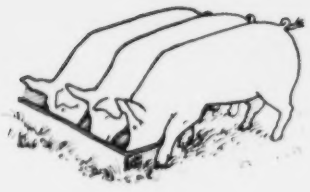
7 If you have already completed Activity Seven, compare your figures with those given to represent domestic waste in Britain.

8 Could your family cut down on the amount of waste it produces in any of these categories? Which category of waste would be easiest to reduce? Which the most difficult? Why?

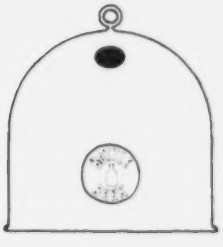
Here's the layout for a table you could use to record your results:

Category of waste	Quantity in Kg and g
Total weight of waste sample	

Activity 9



HOW COULD WE RE-USE DOMESTIC WASTE?



Activity Nine challenges you to think up ways of re-using domestic waste

How could we re-use domestic waste?

1 Look at the chart you drew in Activity Seven to show the different kinds of domestic waste. Describe the six categories of waste that were identified. Make each description no more than one sentence long.

2 For each of the six catergories, suggest possilble ways in which this waste can be re-used or recycled.

Before you start, think about the following points:

- Can the waste be re-used in its original form and for its original purpose?
- Or used in its original form for another purpose?
- Can the waste be recycled?

'Recycling' has two slightly different meanings. It can mean that the waste simply has impurities taken out, so that it becomes 'as good as new'. Water, for instance, is constantly being recycled by having impurities removed. Recycling can also mean that the waste is converted, usually through a chemical process, into a different material. Plastic bottles, for

instance, can be converted chemically into another form of plastic – though of inferior quality. Paper is another material that can be recycled.

- Some waste cannot be recycled or re-used in any way. Instead, it must be disposed of as carefully as possible either in a landfill or by incineration.

3 Is there a way in which any of the six categories of waste could have been used more effectively in the first place so that less ends up as waste?

4 What facilities are provided in your area to help with the recycling or re-use of waste? Draw a map to show the location of bottle banks, can banks, metal collecting points and waste paper collecting points. Are there any other similar facilities?

Activity 10

In Activity Ten you will be using waste pieces of cloth and paper. You will need them for the clothes you are going to design and make.

Making clothes

Here's an Activity which involves using waste paper, card and cloth from your home.

Can you make an outfit from materials which would normally be thrown away in a typical week at home?

1 Spend one week collecting the discarded items.

2 Next design your clothes on paper.

3 Then make the clothes at home.

4 Bring the clothes into school for a fashion show.

Design brief

The clothes you design should be well made – they should not fall apart when you wear them.

They should also fit. (How will you make accurate measurements of your size? Remember to leave an overlap if you are joining up the edges. Your clothes should not fall off or be too tight.)

They should be interesting to look at – try to make an eye-catching outfit.

5 Now discuss in the class the good and bad points of each designer's clothes.

6 What problems did you come across when you were making the clothes?

7 Was making the clothes worthwhile? What were the good things about this Activity? What new things have you learnt? What were the bad things about the Activity?

8 Could the materials have been put to another use? How?

WASTE AND INDUSTRY

Industry and farming provide nearly all the products we want and need in our day-to-day lives.

Just think what you had for breakfast this morning. Ask others in the class what they had. Make a list of all the things that have been eaten by members of your class this morning.

Now divide those items into: things that are produced in this country (eg eggs and milk); and things that come from overseas (eg coffee from Kenya or Brazil, marmalade made with oranges from Spain, and so on).

You can do the same with things you *used* this morning ... the comb you combed your hair with ... the clothes you put on ... the chair you sat on while you ate your breakfast ... the radio you listened to ... the bus that brought you to school (running on diesel fuel).

You can also divide *those* items into: things that are produced in this country (perhaps furniture at home) and things that come from overseas (like the cotton in some of your clothes).

It is easy to see that the products we use come from all over the world. But who produced them, and how did they get here?

They have been produced in farms and factories. They have been packaged and labelled. They have been stored and transported, sometimes for thousands of miles, to the shop where someone in your family bought them.

The farms and factories that produce the things you can buy in your local shop also produce 'waste'. For instance, a furniture factory will produce a great deal of sawdust. Every kind of manufacturing plant has to dispose of products that fail to pass its quality checks. Some of this 'waste' is recycled in the factory; much of it goes to companies who specialise in converting waste into useful materials. In fact a whole recycling industry has grown up, with many specialist categories within it. Some companies collect from factories and farms. Others specialise in household waste, like paper and other packaging materials.

Activity 11

Activity Eleven asks you to examine how industry in general produces the packaging it needs - and how another specialist industry has developed to take care of the packaging after you have finished with it.

Where does packaging come from?

Much of the waste we create at home is the packaging that contained the products we have used. It is obvious to us why we wanted the products that came in the packaging. We need clothes to wear, to keep us warm, to protect us against the weather, or just to look smart and attractive. We need food to keep us alive and well.

But why do we need the packaging that contains all these products?

1 Collect ten different types of packaging - eg plastic or glass bottles, fast-food containers (eg hamburger boxes made out of plastic), cardboard cartons of various shapes and sizes (such as egg boxes), carrier bags and used wrapping paper.

Now make a list of ten different reasons for having packaging at all.

Here's one to start you off: Protection - packaging helps to protect the product. For instance, an electric light bulb you've just bought is less likely to get broken if you keep it in its cardboard carton until you get home.

2 Look at several kinds of packaging. Make a record of the name of the product inside the different packaging. Examine the 'surface design' on the outside of the packaging to see if you can find the name of the town or city where the product was made. Make a list of the ten items and where they were made.

3 On a map of the British Isles, mark the location of the companies who made the different products. Use a road atlas to help you.

4 Mark on the map the town in which you live. Draw arrows to your town from the places where the goods were made. Did some of the products come from other countries? Which ones?

5 Why is it that many of the products we consume come from far afield. Try to list at least four reasons. Talk about them in class.

6 Do the firms that make the products we use also make the packaging? Try to find out. Some of your parents can probably help. If not, write to some local firms asking them where they get their packaging from.

7 Look at some of the packaging you have brought into school. Examine each piece in turn. What are its good points - and its bad points? Does the packaging waste resources in any way? How would you back up your claim that resources are wasted - or not wasted? Would everyone agree? Why?

Activity 12

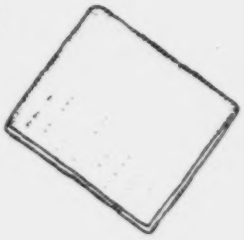
Activity Twelve looks at the amount of packaging involved in wrapping a piece of bubble gum. It asks you to compare measurements of products and their wrappings and asks the question: 'How much packaging is really necessary?'

The bubble gum packet

Jennifer wanted some bubble gum. She bought a packet from the local shop for 20p.

When she opened the packet, she got a surprise.
In the packet was a card this size:

But the bubble gum was only this size!



Jennifer folded the packaging (the wrapping paper) back to its original shape. It was this size:

1 What is the area of the 'flat' side of the bubble gum?

2 What is the area of the front side of the packaging?

3 How much bigger is the front side of the packaging than the flat side of the bubble gum?

4 Give two reasons why the packaging is so much bigger than the bubble gum?

Jennifer showed the bubble gum to her friend Elspeth.

5 Give three reasons why Jennifer might think that the paper is being wasted.

6 Give three reasons why Elspeth might think that the paper is doing a good job.

Elspeth and Jennifer decided to ask some other people what they thought. They first wrote a letter to the company that makes the bubble gum.

Then they asked the shopkeeper who sold Jennifer the bubble gum.

They asked people who lived near the shop.

7 What do you think that each of these people would say to Jennifer and Elspeth? What arguments and evidence would they use to back up what they say?

What do you think?

8 Bring other kinds of packaging to school. How much bigger is the packaging than the products they contain? Measure the size (or weight) of the packaging and compare it with the size (and weight) of the contents. Why do some products have a lot of packaging?

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Activity 13

Activities Thirteen and Fourteen ask you to produce some packaging of your own, using the design briefs suggested.

Making a cube

1 Collect three items of packaging made of card – such as cartons. They should be in good condition. Find the joins which hold them together. Carefully tear along the joins so that you can lay the cartons out flat.

2 Draw a sketch of the shape of the cartons laid out flat. What shapes can you see when the cartons are laid out flat?

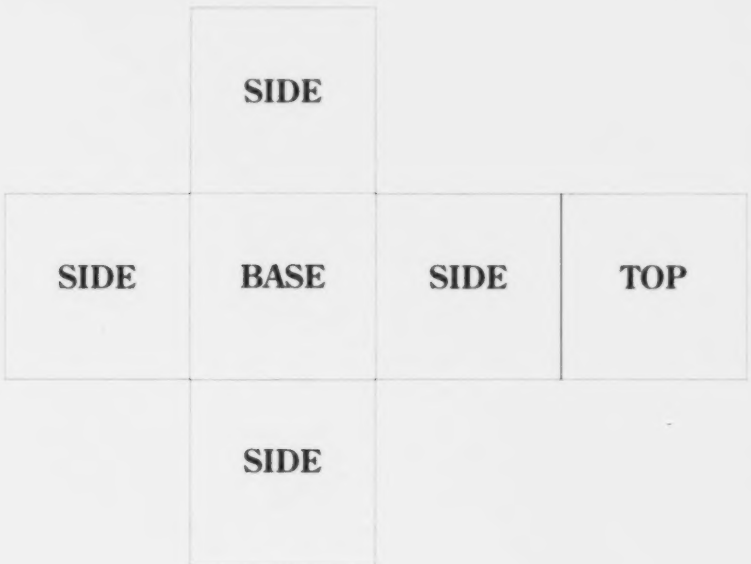
3 Reassemble the cartons in the three-dimensional form. Draw a sketch of the cartons as they looked when they contained products.

4 Are there any parts of the carton that you can't see? Why is that?

The shape of the carton when it is laid out flat is called its 'net'.

5 On a piece of thin card, draw a 'net' for a cube.

Where will you put your tabs?



The side of each square of the cube should measure 10cm. The shape of the net could be like the one shown in the illustration (could it be any other shape?). Do not forget that you will need to add tabs on to your net so that you can glue it together.

6 Before you glue your net, plan a surface design for each face of the cube. Each face could have some information and pictures about your school, or your family, or something you are interested in.

Activity 14

Making a package for a pyramid-shaped chocolate

1 Now design a net for a new pyramid-shaped chocolate. The pyramid is 8cm high.

2 The packaging has to meet six important requirements. Three of them are listed below.

a The packaging should be easy to open.

b The 'surface design' on the packaging should give information about the name of the product and its ingredients.

c The packaging should be easy to produce in quantity.

What are the other three requirements?

3 Why are each of the six requirements important?

4 Make a list of the advantages provided by your packaging. Then make another list of the people who enjoy those advantages.

5 What are the drawbacks of packaging? Write down six drawbacks of packaging like yours. Who suffers because of these drawbacks?

6 How will you know whether the advantages of your packaging outweigh the drawbacks?

The Activities in the section that follows ask you to look at what happens to certain kinds of waste. You can only find some of this information by going to a local manufacturing company, seeing what goes on there and asking questions.

During your visit, you will need to make notes about what you see and hear. Then you will be able to prepare a report of your findings. Activity Fifteen shows you how to organise your thoughts.

Activity 15

Writing a report about a company - or any kind of organisation

The guidelines that follow will help you prepare a report about a company you visit as part of one of these 'waste' Activities.

Before you visit the company, you will need to work out a list of questions covering all the areas you are interested in. You will also want to make notes during the visit itself.

Guidelines for writing your Report

1 Look at the notes you made during the visit.

2 Plan your report in rough first. Decide what each paragraph will be about. This will help you to organise your ideas clearly and tell you how many paragraphs you need.

3 What are the main points to include?

- What is the name of the company?
- Where is it?
- Does it have premises in other areas?
- What sort of things does it have to buy in order to make its products (these are called 'inputs')?
- What sort of products does it create (these are called 'outputs')?
- How are 'inputs' turned into 'outputs'?
- How are decisions made in the company? Who makes the major decisions about what the company should make? Who makes the everyday running decisions? Is the company divided into sections? Do the people who work there have specialist jobs? Is there specialist equipment?
- What are your opinions and impressions about the company? Do you think it runs smoothly? If not, explain why not, and suggest improvements. Were some of the jobs you saw more interesting than others? If you were employed in the company, which job would you like? Explain why.

Activity 16

This Activity asks you to study a company that recycles other people's waste.

You don't always have to repair a broken item in order to make some use of it again. You can do this by re-processing the materials they are made from. This is called 'recycling'.

Many companies specialise in recycling other people's waste. There will probably be one near your school. If there is, it is well worth studying.

Recycling used materials can be a complicated process. First, the materials have to be collected and sorted. When there are enough to make a truckload, they have to be transported to a plant for cleaning and processing.

For recycling to be worthwhile ...

- someone must be able to make good use of the recycled materials ...

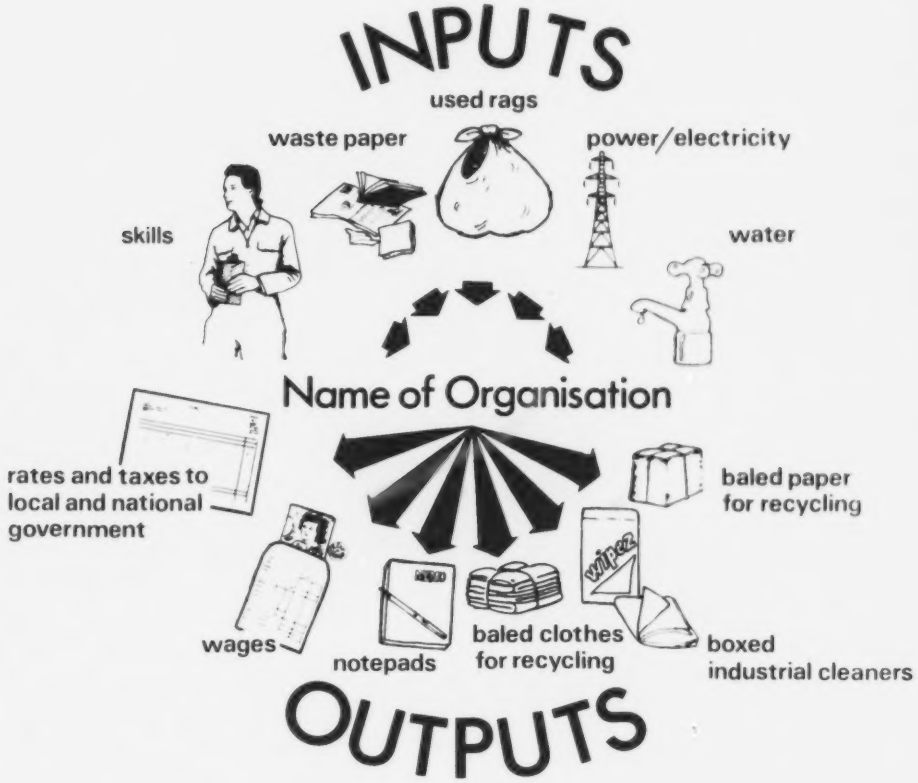
- ...and the costs of transporting and processing need to be lower than the final value of the recycled material.

Note: The costs of not recycling the material must also be taken into account. Assume, for instance, that the cost of transporting and processing waste paper (ie recycling it) is higher than the price it can be sold for. It may still be worth doing if you take into account the money saved by not having to dispose of the waste paper in a landfill or by incineration.

Constructing an inputs, outputs and processes diagram is a valuable way of helping you understand how any company or organisation works. Activity Sixteen looks at a company that specialises in recycling waste.

Preparing an input and output diagram

Activity Fifteen gave you some guidance on how to prepare a report about a company or other organisation that you have visited. An input/output diagram can be an important part of such a report.



An input/output diagram can be used to show the things a company needs in order to create a product, a service or other benefits. Remember that a company does not only produce products and services that it can sell. Other outputs include jobs and wages for its employees, the rates and taxes it pays to government, and the contribution it makes to the community - such as hosting visits from schools.

The diagram on page 28 shows the inputs and outputs of a company that recycles cloth and paper products.

In order to prepare a similar diagram for the recycling company that you visit and study, you will need to think of the things that:

- go into the company - the inputs
- the things that come out of the company - the outputs.

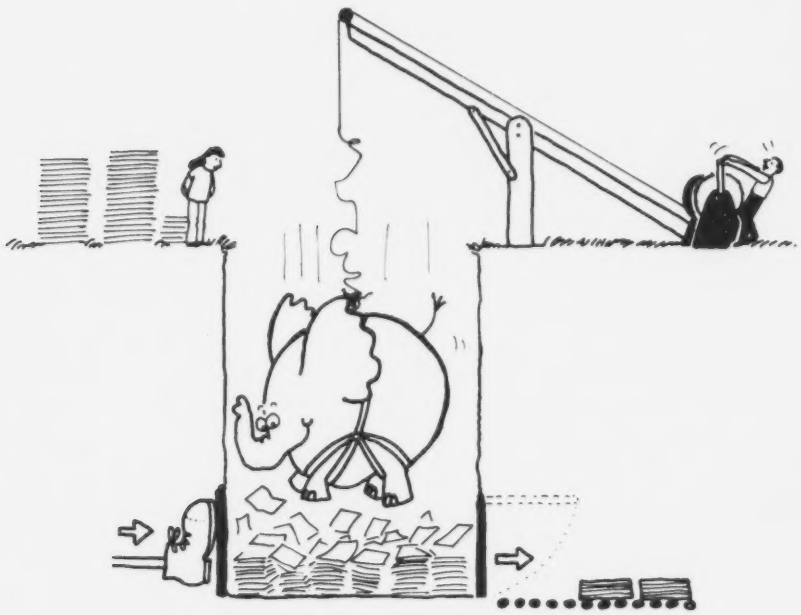
Now plan an input/output diagram for the company you are studying.

Activity 17

Activity Seventeen asks you to build a working model of a waste compactor.

It involves two stages. In the first stage you will be carrying out the initial planning. In the second stage you will make your final plans and actually build the compactor.

Building a waste compactor



During your visit to a recycling company, you will see some of the industrial processes that turn 'waste' material into material that can be used to make new products. You may get some ideas for designing and constructing a piece of 'recycling' equipment.

This Activity was devised by a teacher whose students had visited a factory where waste paper was being compacted and baled up before being sent to another factory for re-processing into 'recycled' paper.

Your task is to design and build a working model of a paper compactor.

The model should be able to compact clean waste paper into bales with a volume of 1,000 cubic centimetres. The bales can be held together with tape or rope.

You can work with other pupils as a group. This means that you must share your own ideas and be prepared to listen to other people's.

When you are making anything, it always helps to go through one or more planning stages. Often you do it instinctively - if you want to make a model aeroplane, for instance, you make sure that you have all the materials and tools you need, and most important, that you have a design to follow.

Here are the planning stages you will need to go through before actually building a waste-compactor:

Preliminary

1 Write down the meaning of the word 'compact'

2 Work out how many different ways of compacting paper you can think of? Here are some suggestions:

A push-rod method

A lever method

A screw and thread method

3 What materials could you use to make your model? What materials have you available at school? Possible materials include: plastics, wood, metal, string, rubber.

4 Is it possible for the model to have moving mechanical parts?

5 What shape of bales do you plan your machine to make? Volume = Length x Width x Height. So you can vary the length, width or height of the bale to get a total volume of 1000 cubic centimetres.

Stage 1

Note: if you are working in a group, write down the names of the other people.

Each of you should do the following preparatory work on your own:

- Make a 'three dimensional' sketch to indicate the design of your proposed machine.
- Suggest a name for the machine.
- Describe what your machine will do and how it will work.
- List the materials you think you will need.
- List the tools you will need.

Now look at each other's sketches and discuss them in detail. This is how you can do it:

a Each member of your group explains their design and how it works.

b Then the group discusses each design, asking and answering the following questions:

- Will it do the job?
- Is it easy to make?
- How will the model be held together?
- Do you have all the necessary materials for making it?
- Are the right tools available?

c The group then decides which design it wants to make, and whether any modifications are needed.

d Discuss your designs with your teacher to check whether they will work.

Stage 2

You are now ready to make your final plans and build the compactor.

1 First, make a detailed 'three-dimensional' sketch of your agreed design.

2 Now draw three views of what the machine will look like: from the front, from the side and from above.

Set out your diagram like this:

Front view Side view View from above

3 Indicate the approximate length, width and height of your model.

4 Describe how you will make the model:

- What will you do first?
- How will you get your materials together?
- How will the model be joined together?
- How will you finish off your model so that it looks efficient?

5 Once you have begun to build the model, you may want to change some of your original ideas. Before you do, make sure that your new thoughts are really workable.

You will also come up against problems. Keep a record of them. Even more important, record how you tackled them.

You can record your progress on a chart like this:

Progress Sheet

Date	Problem	Solution to problem

Activity 18

Designing and building your model paper compactor will take quite a bit of time. So it's important to think carefully before you start and work out what you are going to do.

You can also go back over what you have learnt about model-building in Activity Seventeen.

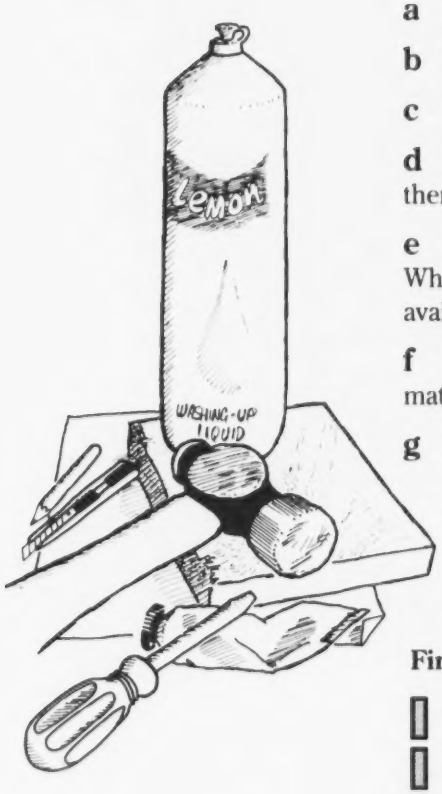
Activity Eighteen helps you collect your thoughts. It shows you how to assess what you have done, how you did it, and what you have learnt from it.

Thinking about model building

1 Go back in your mind to when your group started thinking about the model. What was the original task? And what was the first design you came up with?

2 Draw a sketch of the final design of your model. Now compare it with your first design.

3 Write a report about your group's model making. Use the questions listed below (a-g) to help you. Write on A4 paper.



a What are the names of the people in your group?

b How did you decide on the original design?

c How did you make the actual model?

d What problems did you have - and how did you overcome them? Your progress sheet will remind you.

e Which tools did you use? Were any of them difficult to use? Which tools would you like to have used - if they had been available?

f Which materials did you use? Did your original design need materials that weren't available?

g Did the group work well together?

Final questions to think about

- Do you think that your final design could be improved?
- If so, how?
- Can you think of better ways of working together to make the model?
- Do you enjoy making models like this? Was it easy or hard, challenging or not challenging, fun or a drag?
- Would you like to work like this again?
- Why is it harder to make models with moving parts?

Activity 19

In every part of the country there are companies and organisations that specialise in handling household waste. How does your local company operate? What does it set out to do? What are the implications of the way it disposes of the waste?

Studying a company or organisation that deals with household waste

Have you ever wondered what happens to the contents of your dustbin? Every week people come along, empty it into a lorry, and then take it away.

Britain buries nearly all its waste in holes in the ground - and 'buries' £1 million a day in doing so. £1 million is its 'energy value' - the value of the energy you would get if you burned the waste. That means that the contents of your dustbin could be worth as much as £20 per ton!

In the course of a year, the following amounts of waste will be put into - and emptied out of - a typical dustbin: 90 lb of plastic, 312 lb of paper, 310 lb of mixed food waste, 40 lb of metals and 90 lb of glass.

Because of the high cost of land in and around towns and cities, landfills - where waste is buried - have to be located further and further away. This increases transport costs. It is becoming a very expensive business to bury waste.

Putting waste into holes in the ground is called 'landfilling'. In this country we quarry a great deal. Some of the holes that are left fill with water and are used for leisure and sports activities. Others are filled in again with rubbish and then landscaped - some former landfill sites are now golfcourses, parks or even farmland.

One problem of landfill is that gases build up under the ground. These can be very dangerous if the gas comes to the

surface and catches fire. Sometimes the gas is tapped and burnt to provide usable energy.

This Activity asks you to find out more about the organisation that disposes of household waste in your area. It also asks you to think of the effects of landfill.

1 What is the name of the organisation that handles domestic waste in your area?

2 What does this organisation set out to do?

3 How does it make sure that all the household waste it collects can be disposed of?

4 Where does it put the waste?

5 Does it handle different kinds of waste in different ways?

6 Does it dispose of waste in landfill sites? If so, where are they? Has it always used landfill sites?

7 How do they make sure that the landfill sites are safe?

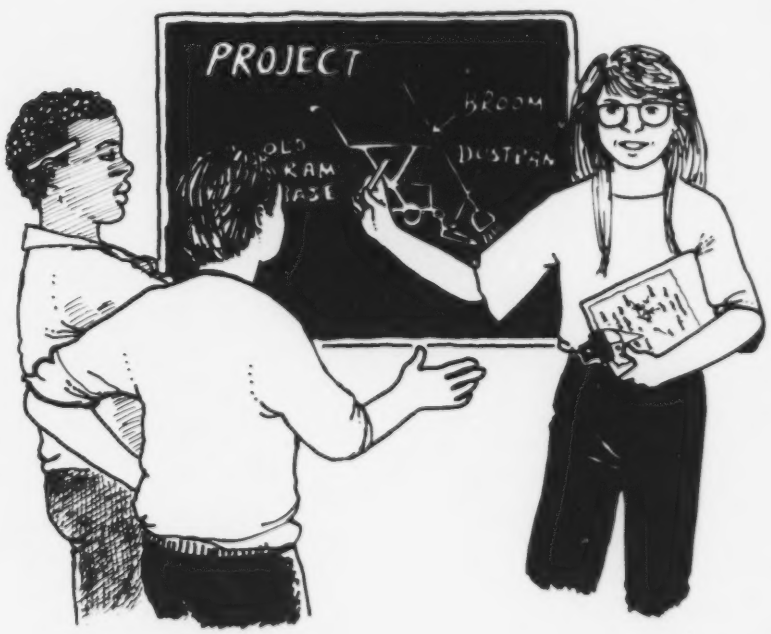
8 What will happen to the landfill sites when they are full?

9 What do you think of landfilling? Is it a good way of managing waste?

Activity 20

In the following Activity you are asked to build a model of a litter-collector. You will need to look at the detailed planning instructions you used when you were building your waste-compactor. The planning instructions given below are only a summary of those given for the compactor.

Making a litter-collector



Your task is to design and manufacture a machine that will collect litter. The machine must not be any wider than 400mm or longer than 500mm.

Before you begin, work out your responses to the following questions:

- How many different methods of collecting litter can you think of?
- Which of those different methods can you build into one machine?
- What materials do you plan to use?
- Can you have moving parts?
- Will the machine store the litter it collects?
- Will the machine be pushed - or pulled?

Now you can start your design in earnest.

1 On A4 paper, draw a 'three-dimensional' sketch of your proposed machine.

2 Now draw a front view, a side view and a plan view (a 'plan' view is a view from above) of the machine.

3 Explain in words how you intend to build your machine.

4 Write down the names of the materials you think you will use.

Once you have collected your materials and the necessary tools, you can start to build.

As the building progresses, you may decide to change the original design in some way or other. Keep a record of any changes you make. It is also important that you record any problems you meet - and how you solved them. You could do this on a sheet of A4 paper, with headings such as these:

Date	Problem	Solution

Activity 21

The following Activity deals with the writing of thank-you letters. You should always write a letter of thanks to people who have come to the school to work with your class. You should also write to organisations and companies that you have visited. Not only is it good manners, but it also helps to build links between the school and outside organisations.

The people you have visited want to know how you benefited from your visit. They would also like to hear your suggestions for improvement. You can tell them what you found most enjoyable... the new things you learned...the places where you would have liked to have spent more time... and the things you would have liked to have done but didn't.

You can also ask them to explain anything you did not fully understand.

Writing a letter of thanks

Your task is to plan and write a letter of thanks to either a visitor who has spoken in class or to someone whose premises you have visited.

Before you start, work out the answers to the following questions:

1. Where does your address go?
2. Where does the address of the person you are writing to go?
3. How will you set the letter out?
4. How many paragraphs will there be?
5. How will you begin the letter?
6. How will you finish it?
7. What points will you include in your letter?

Now you can start to write. Use A4 paper with ruled lines, or a line guide.

PART 5

WASTE AND THE ENVIRONMENT

The environment is the surroundings in which we live.

Man's natural environment is the surroundings created by nature. It is made up, among other things, of air and water, rock and soil. It includes lakes, seas, forests and deserts. It is home to plants and animals.

Over the centuries, man has adapted this natural environment to his own needs. He has cut down forests, drained marshes, cultivated the land wherever he could, built cities, constructed roads and bridges, dug out valuable minerals, set up factories, travelled the seas, flown in the air and even into space.

Today the industrial world can turn out more products than ever before. However, people are increasingly aware of the importance of the environment - and realise that material progress is not without cost.

- We are rapidly using up some finite resources ('finite' means that there is not an endless supply).
- Waste products can be harmful to humans and the environment.

Energy and the materials used to produce it, such as oil and coal, are important resources. So are raw materials generally - such as iron ore and bauxite. Many processed materials, such as steel and aluminium, made from the raw materials can be recycled. Recycled materials are usually inferior in quality to the original. However, they can still be used very effectively to make a variety of products for end-users.

Sometimes a recycled material is as good as the original and can be used for the same purposes. A good example of a processed material that can be used again and again is aluminium.

Moreover, when recycled aluminium is used, there is an energy savings of 95%. So it saves money on fuel and also reduces pollution.

The Activities in this section cover a number of areas concerning waste and the environment. The issues you will be considering include: river pollution; the effect of pollution on a food chain; and what the world of waste might look like to an alien from another planet.

Activity 22

Look at the drawing of the street market. Where can you see 'waste'? Now think about your very first description of waste. Do you want to change it? Or add to it? Is it possible to cut down on some of the waste you identify in the drawing?

Waste in an everyday street scene

1 Working in groups of three or four, study the street market illustrated in the drawing.

2 Make a list of all the things you can see which can be called 'waste'. Why are they waste? What caused them?

3 Can any of the waste be reduced?

4 Would it be worthwhile to reduce any of the waste? Who would benefit if the waste were reduced? Why?

Activity 23

Activity Twenty Three invites you to take part in a role play. A river has been polluted and it is important to find out who or what is responsible so that further pollution can be prevented.

'Pollution' means the contamination of something- usually water, air or soil - with harmful and poisonous substances to such an extent that it can no longer fulfill its proper functions.

For instance, one of the functions of a river is to provide a home for water birds. If there are sufficient contaminants (eg chemical waste) in the water to damage the birds' health, then we can say that the river is polluted.

Rivers of course contain a delicate balance of life systems which have developed over enormous periods of time. These life systems include, as well as birds, fish, plants, insects and other animals. Each has its own living requirements and each is to some extent dependent on its neighbours. The introduction of even small amounts of contaminants can have an effect on one or more of those life systems.

Incident at the river

This Activity is a role play exercise. It is about waste substances in a river.

For this Activity you will first need to look at:

- A sheet of background information.
- Your role card.
- A map showing where the incident happened.
- A sheet listing possible ways of dealing with the problem.

This is your programme:

First you should spend about 35 minutes to read the information and learn your part. You should make notes of what you plan to say. You should act your part forcefully in front of the Tribunal.

The Tribunal (the Court) will take another 35 minutes.

The members of the Tribunal will need about five minutes to present their recommendations.

Background Information

The newspaper cutting below is taken from the Middlewick Post for August 20 1989. It refers to a pollution incident in the River Wyth.

First read this extract:

THE MIDDLEWICK POST

20 AUGUST 1989 | YOUR VOICE IN THE LOCAL COMMUNITY | ISSUE 21 25p

SHOCK FOR BATHERS IN THE RIVER WYTH!

The worst ever case of pollution in the river Wyth happened this week. Shock number one faced bathers Kirsty Munro and Alan Nokes. The two teenagers had not realised that a little horseplay in the water would lead to a week in hospital as a result of something nasty mixed in with the water.

Shock number two faced angling club president Jock MacDonald on Tuesday night. He sat down at his usual fishing position to find that there were no fish to be caught.

Shock number three faced the children of Lower Middlewick who found two dead swans lying in the rushes.

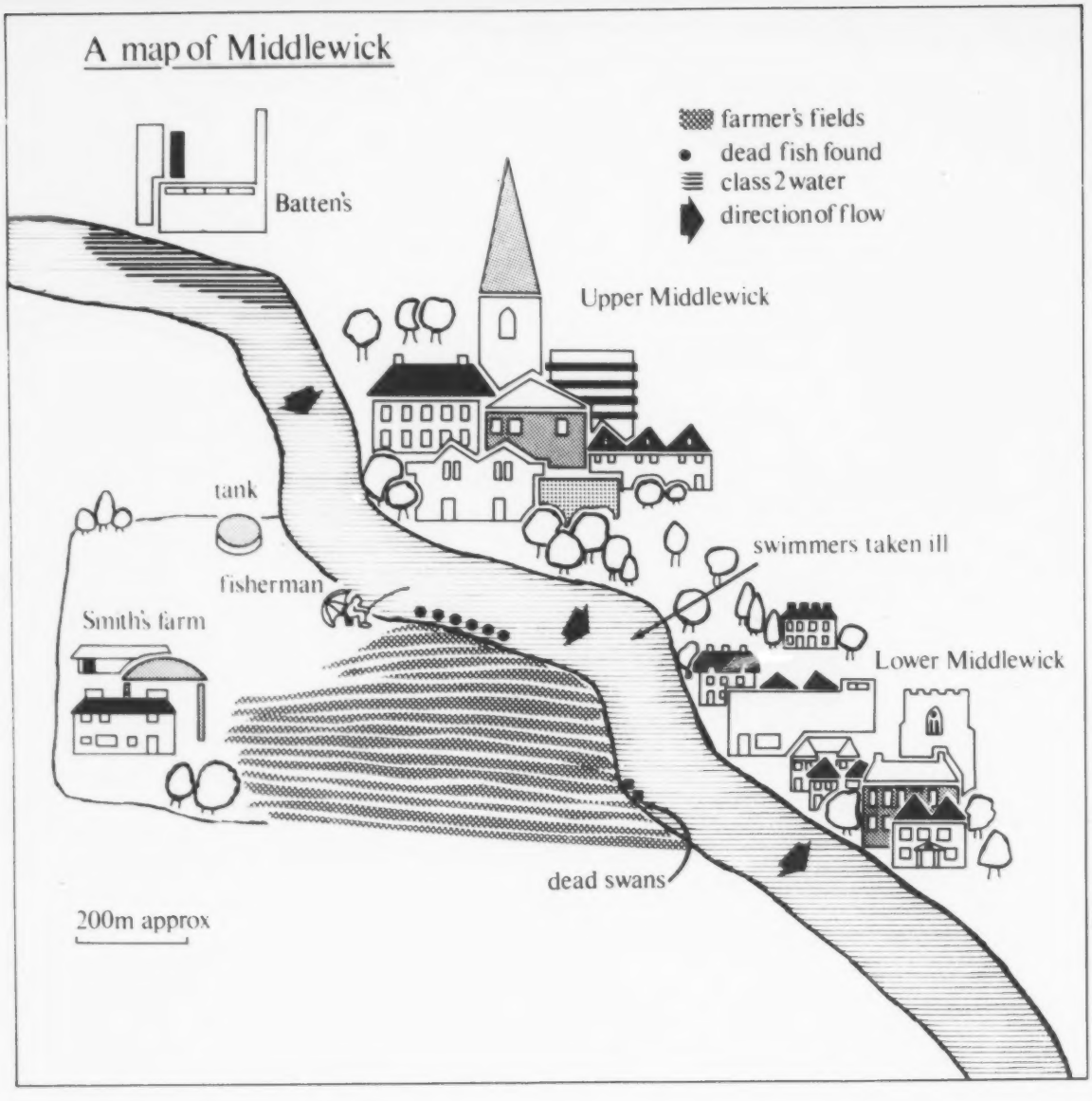
Shock number four was the smell coming off the normally clean waters of the Wyth.

The police and river water authorities are hot foot in pursuit of the culprits. It is suspected that the pollution was caused by the dumping of some kind of waste into the river.

CHANGE ... MARKET

Proposals before the Council, if accepted will lead to a ... of market ... Tuesda... day.

Because of the seriousness of the incident, the local council has decided to set up a Tribunal to find out who or what is responsible for causing the pollution, whether it was caused by accident, by carelessness or deliberately. The Tribunal is also expected to make recommendations for dealing with the problem.



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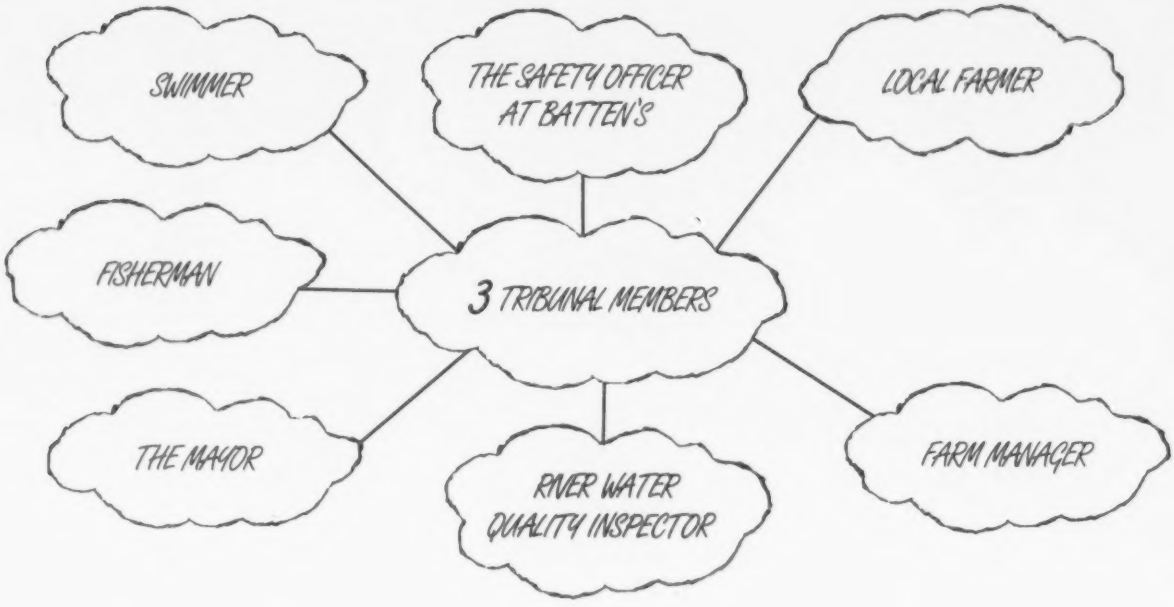
Who is involved in the role play?



Water classification

In this country, river and lake water is classified, officially, under four headings:

Class 1 water is very clean, can be used for drinking, presents no problems to swimmers.

Class 2 water is slightly polluted, but presents no hazards.

Class 3 water should not be used for drinking.

Class 4 water is dangerous, and very harmful to fish.

Ways of dealing with the problem

1 A ban. The person or group responsible for causing the problem could be banned from all activities likely to cause a repetition of the pollution. The ban could be temporary or permanent.

2 A fine. If the pollution was caused deliberately or through neglect, the person or group responsible could be fined. The size of the fine could be determined by the cost of cleaning up after the pollution. Alternatively, the fine could be considerably higher, at a level that acts as a deterrent to other potential polluters.

3 Clearing up. The person or group responsible for the pollution could be made directly responsible for clearing it up.

4 No action. The pollution could be regarded as an unfortunate accident for which nobody can be blamed.

5 Community Service. If the pollution was caused deliberately by an individual or group of individuals, perhaps as a 'joke', then some form of community service may be a suitable punishment.

In deciding how to deal with the problem, you should be certain in your own mind whether your aim is to:

a punish the guilty person or people.
b make sure the pollution never happens again.
c compensate those who have suffered.
d or a combination of all three.

Role Play Card No 1

THE TRIBUNAL

Your job is to run the meeting and then to decide:

i who is responsible
ii what action should be taken

You will need to ask each person in turn for their side of the story.

The order for the interviews will be as follows:

1 The swimmer.

2 The safety officer at Batten's.

3 The farmer.

4 The farm manager.

5 The representative of the National Rivers Authority.

6 The fisherman.

7 The Mayor.

Role Play Card No 2

THE FISHERMAN'S STORY

On Friday the 17th August last year you decided to do a spot of night fishing. It was a beautiful night for fishing, with the moon shining on the river surface between breaks in the clouds, and every now and then short heavy showers of rain.

You had just unpacked your fishing bag and set out your rods when you noticed something lying on the surface of the water. On looking closer you realised that a number of dead fish were lying on top of the water. Lifting one of them up to the river bank with a landing net you saw that the fish appeared to have foam coming out of its mouth and was quite smelly. You walked down the river bank towards Lower Middlewick for about one hundred yards. It seemed that every fish in the river had been killed.

You rushed home and phoned the police. The next morning the police came round to the house to tell you that pollution of some kind had been emptied into the river at some point between Upper and Lower Middlewick.

You are disgusted by what happened. You do not know who was responsible but feel that they should be severely punished. As Chairman of the Middlewick Fishing Club you would like to see whoever is responsible being made to pay for the river to be restocked. You would also like to see them fined.

Once you have listened to each of the actors' parts you will then call back to the witness stand some of the actors for further comments about what the others have said.

When you interview witnesses, you should ask them questions like:

Who do you think was responsible for the pollution?

Was it done deliberately, or by accident, or through carelessness, or through human error or through serious neglect of precautions?

What measures should be taken to see that it doesn't happen again?

Do you think that those responsible should be punished?

Who should be responsible for cleaning up the mess?

Do you think that the victims should be compensated?

Role Play Card No 3

THE MAYOR'S STORY

You are the Mayor of Middlewick. On the 18th August last year the phone seemed to ring all day with town's-people from Middlewick complaining about the damage to the river. There were complaints about the smell coming off the river. Also ...

- Two swimmers had been rushed to hospital after going for a dip in the river.
- Some baby swans who had been the 'darlings' of the whole town had been found dead on the river bank.
- Hundreds of fish had been killed.

You are furious about the whole thing. Middlewick was just beginning to attract tourists because of its beautiful riverside walks.

You do not want to point an accusing finger. However, you would like to see a heavy fine for those responsible.

You would like to see compensation being paid to those who suffered. This should never be allowed to happen again.

Role Play Card No 4

THE SWIMMER'S STORY

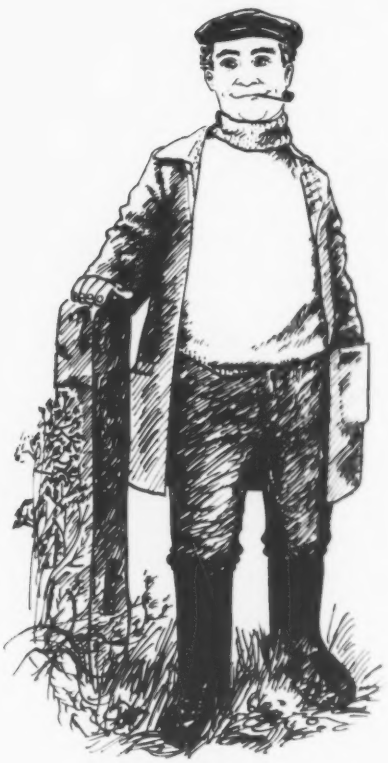
On the 18th of August you and a friend had been messing about on the bridge which overlooked the river. You had noticed a strong smell in the air but thought that it came from a nearby farm. It was a hot day and you had often splashed about in that part of the river on a previous summer. The two of you stripped off your outer clothes and ran into the cold water. Your friend grabbed one of your shoes and threw it into the water. You dived down and grabbed the shoe, but on surfacing you began to feel dizzy. You had crawled out of the river and been sick. A passer-by had to help your friend out of the river and had called an ambulance. The two of you had to spend a week in hospital and had missed an important school trip. You are now reluctant to go near the river and will never swim in it again. You would like to see something being done to stop river pollution.

Role Play Card No 5

THE SAFETY OFFICER'S STORY

You work for J. W. Batten Chemicals, a firm that makes protective coatings for paper. The firm is allowed to release its waste into the river in small quantities but the firm is very careful. Over the years there have been a number of complaints by the river water authorities about pollution in the water. You are aware of the National Rivers Authority's policy of having all the water in the river at Class 2. On the 17th August you had taken a test sample of river water just below the factory and it had met the required standards. On the 18th of August you had been called out of bed by the police and told about the pollution at Lower Middlewick. Throughout the day on the 18th you took readings and found that the pollution could not have been caused by Batten's. This has been backed up by an inspector from the National Rivers Authority.

Role Play Card No 6

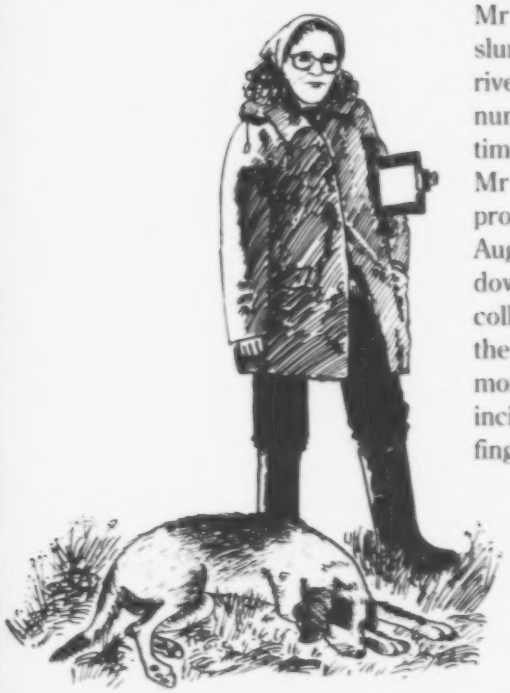


THE FARMER'S STORY

Your farm lies between Upper and Lower Middlewick. In the middle of August you instructed your farm manager to rebuild the slurry tank which takes the waste products from the farm. The tank needed to be strengthened because you had noticed small quantities had been spilling into the river. You had been worried about being prosecuted by the National Rivers Authority but felt that they had not yet noticed because of the chemicals already in the water which you thought had come from Batten's.

The farm manager had reported that on the 16th of August some of the slurry had slipped down into the river during repairs. However, the next day the tank had been strengthened. On the 21st August the police had been round to ask if any of your livestock had been killed by the pollution incident. You reported to them the problems of the slurry tank.

Role Play Card No 7



THE FARM MANAGER'S STORY

Your job is to run Smith's farm on behalf of the owner, Alf Smith. Mr Smith had been worried for some time about the safety of the slurry tank which was leaking small quantities of waste into the river. You had pointed out to him dead fish near the river bank on a number of occasions. The National Rivers Authority had not at the time been aware of the problem and you had been instructed by Mr Smith to strengthen and improve the tank before the Authority prosecuted the farm. Work had started on the morning of the 16th August. Unfortunately, however, there had been some heavy downpours of rain in the evening. Part of the slurry tank had collapsed causing a considerable amount of waste to run off into the water. You had worked all night to repair the tank and by morning everything was in order. You had read about the pollution incident in the paper but everyone seemed to be pointing their finger at Batten's.

Role Play Card No 8

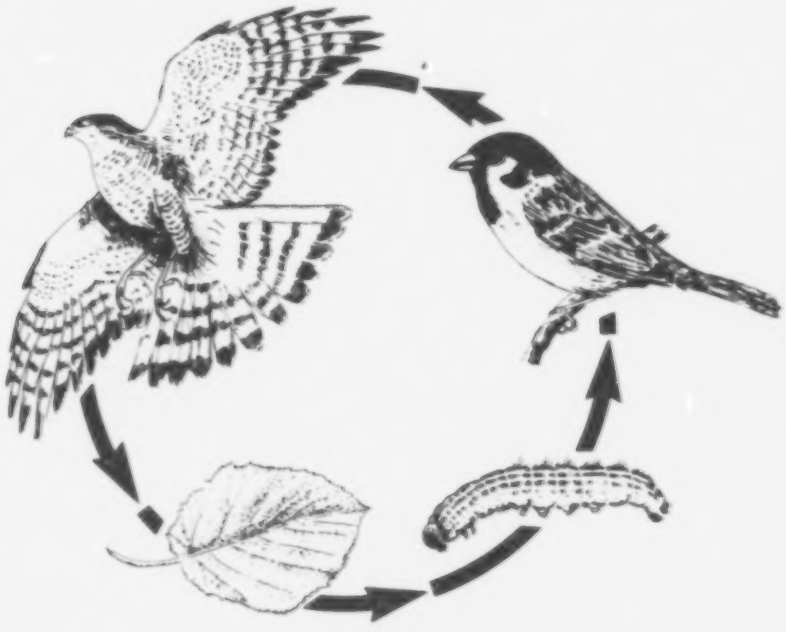
THE RIVER WATER QUALITY INSPECTOR'S STORY

Your job is to check that the river is kept clean. You have been trying for some time to reduce the waste left by Batten's in the water – but they meet the required standards. At first it looked a clear case of Batten's having polluted the river. The river in Lower Middlewick was in a terrible condition. It was as if overnight the river had been changed from Class 2 to Class 4 water. However, the funny thing was that the water directly outside Batten's was a lot cleaner than further downstream. You then discovered that the water by Smith's farm was particularly bad and you are almost certain that the cause of the pollution was the faulty slurry tank.

Activity 24

The phrase 'food chain' is used to describe the dependency of different species on each other for nourishment. There are countless millions of different food chains in nature. The diagram gives one typical, but much simplified example:

The caterpillar eats the leaf... the sparrow eats the caterpillar... the sparrow hawk eats the sparrow. The chain is completed when the sparrow hawk dies, and its body decomposes in the earth to provide nourishment for the tree which produces the leaf which is eaten by the caterpillar, and so on and so on.



How can waste affect a food chain?

Your task is to consider the following questions:

1 Describe in writing the order of a typical food chain.

2 Sulphur dioxide and other substances are among the 'waste' products created when coal and oil are burned (in power stations for instance). These substances can rise into the atmosphere where they may be converted into acid and carried for long distances. They can then fall to the ground to form what is known as 'acid rain'. This acid rain is taken up into plants and trees.

What do you think will be the effect of acid rain on the plants and on the food chains they support?

3 Can you think of any other wastes that might harm food chains?

Describe their possible effects.

Activity 25

Writing about waste and the environment

It is useful to be able to say what you think about waste and the environment - and to say it in a clear and interesting way. This Activity asks you to tackle a writing project about the environment from two different angles.

1 A world without waste management

Think of a world without any waste-management services. Describe in your own words what would happen to our environment if industrial waste and domestic waste were not handled safely and well? How would your life and that of your family be affected? How would your local area or the country as a whole be affected? And would there be any effect on other parts of the world – in Europe say?

2 An alien looks at this planet's waste

Imagine you are an alien from another planet visiting Earth in a spaceship. Write a story describing all the waste created by earthmen, that you can see as you zoom around- sometimes only a few feet above the ground.

Consider the possible harm that all that waste is wreaking. Then explain what you, as a super intelligent being, would do to prevent this waste - or at least dispose of it before it could do any harm.

Activity 26

Activity Twenty Six asks you to consider carefully why we actually throw away, as waste, resources that are non-renewable. 'Non-renewable resources' are resources that cannot be re-created once they have been used and destroyed. Oil, for instance, is a non-renewable resource - once it has been used it has gone for ever. Iron ore is also non-renewable (no-one can 'create' iron ore in a laboratory or factory).

However, some non-renewable resources, or rather the products we make from them, can be used more than once, either by recycling or by simply adapting them physically.

In this Activity, you are asked to work out how to re-use items which other people have thrown away as waste.

Survival

Imagine that you are on holiday in Scotland. You are travelling by ferry boat from the mainland to one of the islands. During the evening, the ferry runs into bad weather, with thick fog and high waves. Suddenly you hear a loud scraping noise followed by a crash as the ferry runs onto some rocks. The captain of the boat orders all passengers into the lifeboats. You have just enough time to scramble into a lifeboat with four other children before the ship goes down.

As night falls, you come ashore on a deserted island, feeling damp, cold and miserable.

The next morning you explore the island – there is no sign of life, except for an abandoned workman's hut. In the hut you find a box of tools and equipment. There is a hammer, a saw, some nails and a ball of string. On the beach you discover some empty cans that have either been washed in by the tide or left by campers. There are also pieces of driftwood lying around.

1 Write a story about your first night on the island.

2 How could you use the driftwood to help you survive?

3 List all the things you could make with the cans using the tools you found in the hut.

4 How many cans would you need for each item? How many cans altogether will you need in order to make all the items you would like to make?

5 However, you only manage to find 50 empty cans in total. So you can only make some of the items. Which ones will you make, how many, and why?

6 Working in groups of three or four, compare your lists. Are your lists the same as other people's or different?

7 Now decide, in your groups, which five items are most important for survival.

8 How did your group make its decision? Was the way you made the decision fair to all involved? How long did it take?

9 How did other groups arrive at their decision?

10 Were the empty cans you used really waste? Explain your answer.

11 What about the pieces of metal left over from the cans when you had finished with them? Are they waste?

Activity 27

Trouble at Deetown

Read the story before tackling this Activity.

1 Were the people of Deetown right to feel proud of their clean and tidy town?

2 Who should be responsible for keeping a town clean and tidy? How can people living in a town make sure it is kept clean and tidy?

3 How did the citizens of Deetown benefit from living in such a clean town?

4 Is litter a problem in your area? Where in particular is it a problem? Can you do something about it? What precisely can you do?

5 Write your own children's story about litter and other forms of waste.

NOTES

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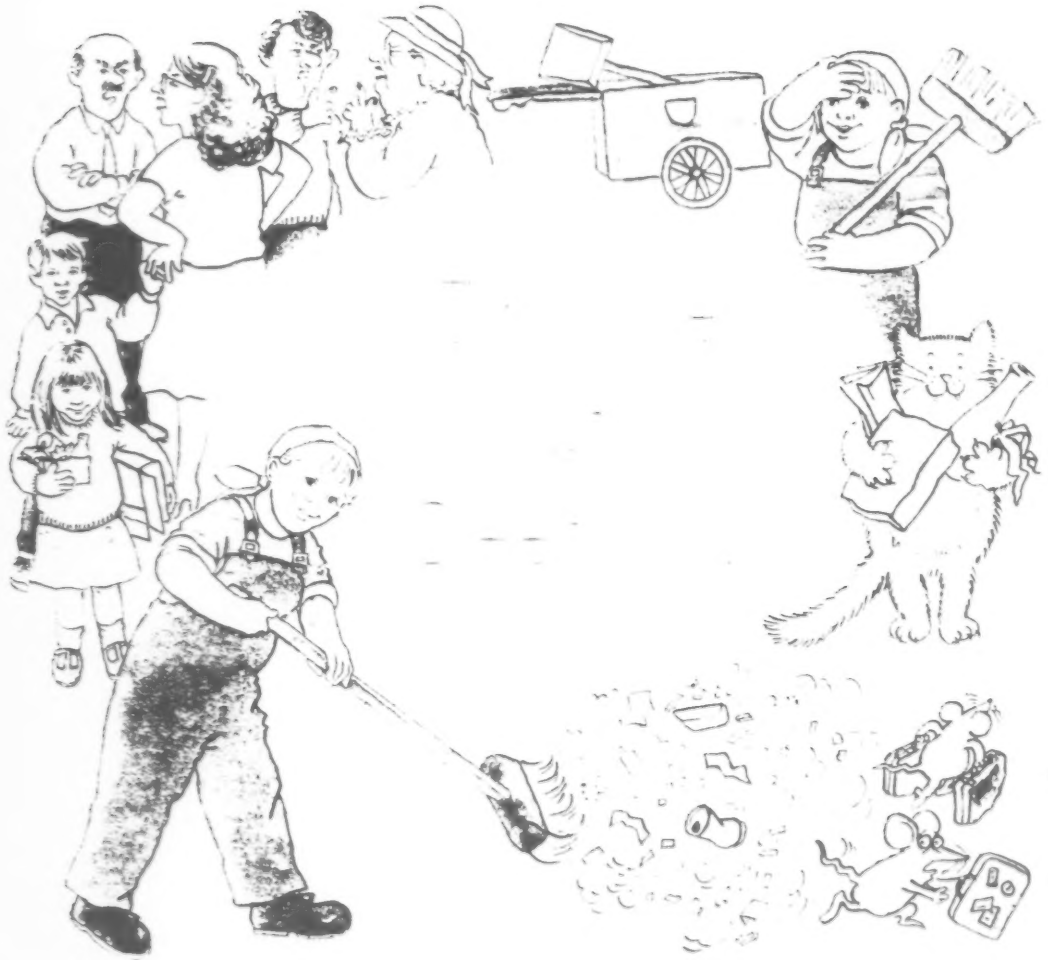
3 TROUBLE at DEETOWN

What a WASTE!



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STORY BOOK

Trouble at Deetown

The trouble began the day Polly was taken ill.

Polly? Who was she?

Well, before the trouble, not many people could have told you who she was. It was quite different afterwards, as you will find out.

Mark you, people could not be blamed for not knowing much about Polly. Polly was one of those quiet people who just seem to fade into the background. From first thing in the morning until late into the evening, she would be working with her brush and little cart, keeping the streets of Deetown clean and tidy.

Polly's job did not help her to get to know many people. She was the town's road-sweeper, and who bothers to stop and talk to road-sweepers?

Mind you... if anyone did stop for a minute to watch Polly at work, they would have been greeted by a warm friendly smile and a pair of twinkling eyes.

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You might think, then, that because people did not pay much attention to Polly that this would make her unhappy. Not so. In fact you could say that Polly was one of the happiest people in Deetown. From the time that she was a little girl, she had always wanted to be a road-sweeper like her Dad.

Polly's Dad had been the Deetown road-sweeper for many years. Polly had loved sitting with him in the park on sunny afternoons on her way from school. He would tell her about the adventures he had had during the day. Polly's Dad had always been happy because he knew he was doing a good job. In any case, he was a kind man who believed it was good to be alive. Polly decided she wanted to be like him, so when he retired, she applied for the job.

That is how she came to be the Deetown road-sweeper and why she was such a happy person.

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The people who lived in Deetown were very proud of their town. Every year they won a prize for the flowers in their gardens and around the town.

Above all the town had a good name for being very clean and tidy. In fact, it was known as one of the nicest and cleanest places in England. People came from far and near to visit Deetown and every year more and more people came from other countries too. So shops were always busy and there was work for everyone.

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All was fine until the day Polly fell ill. She had never been ill before. The fresh air and hard work had always kept her healthy. So when she woke up feeling sick, she tried very hard to get out of bed and go to work. But it was no use. She was very ill indeed.

Usually when people are too ill to go to work, they telephone the others to let them know. The problem was that Polly could not afford to have a telephone. There was another difficulty. Polly started work, sweeping the roads, long before other people were out of bed. So there was nobody up and about for her to tell.

Polly lay in bed, not only feeling very ill, but she was also unhappy because she thought she was letting everybody down.

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Morning came, and people began to leave their houses to go to school and work. Gradually they began to notice that something was wrong. At the end of one road, somebody had tipped a litterbin over and there were cans, cartons and all kinds of other rubbish on the pavement.

In the middle of the town, there were also lots of food containers dropped by people who had eaten from them the night before and just left them for someone else to clear away.

As Polly lay in bed, she could see what was going on from her window. It made her feel even more ill as the time passed.

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Schoolboy Tom didn't notice anything different. He and his sister, Mandy, had just gone out, leaving things lying about on the floor for their mother to tidy up. Tom came out of the shop with a bar of chocolate, tore off the wrapper, and dropped it. The wind caught it, and it went flying down the road. Mandy, who liked fruit better than sweets, had bought a banana. By the time they reached the end of the road, she had eaten the banana. She then threw the skin at her brother (they had been squabbling as usual). He managed to dodge it, and it fell on the pavement. Tom laughed, as he ran away, kicking a can while he ran.

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As the morning wore on, people began to see that something really was wrong. Not that this made them behave in a better way.

At the bus station, there were used tickets littering the places where people got off the buses – and the piles were getting bigger. Smokers were flicking ash and dropping cigarette ends all over the place. Dozens of people were popping sweets into their mouths and just throwing the wrappers away. Others were drinking out of cans and bottles and leaving the empties anywhere.

By lunchtime, things got worse. Fish and chip shops and take-aways were doing a roaring trade. All over town you could see people enjoying a meal out of paper and cartons. The problem was that not many of them seemed to know why litter bins were provided – so they simply threw their rubbish on the ground.

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Lunchtime came and went, and by the middle of the afternoon, even boys like Tom noticed that things were getting bad. People began to complain, saying things like, 'Where is all the litter coming from?' Most were saying what people often say when things go wrong, 'Somebody should do something about it!'

Unfortunately, there never is anyone around called Mr. Somebody or Mrs Somebody.

One man, called Mr. Bean, who was always smoking and dropping cigarette ends everywhere, decided to go storming down to the Council office. But by the time he found a parking place, the office was shut. To make matters worse, it was a Friday, and worse still, the following Monday and Tuesday were holidays too. He was so angry that he kicked a cardboard box lying outside the office and sent its contents flying.

By Wednesday, as you might imagine, the town was in a terrible state. The streets were all looking like rubbish tips. Everybody was saying that something must be done, but the strange thing was that they were all actually making things worse.

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But what about Polly? When it was discovered that Polly had not been to work, someone from the Council went to ask why. They found her lying in bed very ill. She lived all alone, so the visitor called a doctor who came and gave her some medicine. She was sure she would be well enough to go to work quite soon, but by Monday she was still ill. The Council then decided to get someone else to do her work. They put an advertisement in the Deetown Herald, but they got no replies. They asked for volunteers from the other council workers, without success. The town had become such a mess that no-one wanted the job of cleaning it up.

Days passed, and litter piled higher and higher. Soon people had to be careful as they opened their doors, there was so much rubbish lying about. Walking along the pavements was almost impossible. The smell was horrible and, worst of all, rats and mice began to appear in great numbers. You could see them everywhere, scampering about looking for food, playing games, and even making nests. Even the cats were scared of them, there were so many.

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At last, it was decided to call a meeting of all the people of Deetown. The hall was crowded as speaker after speaker got up to complain that the litter was making life a misery. Soon a big row developed as everyone began to blame everyone else for the mess. The adults said it was the children. The parents said it was not the young children but the older ones, those who stayed out late at night. The smokers blamed the drinkers and drinkers blamed the people who used take-aways. They said that most of the litter was caused by people throwing away their old newspapers.

The noise got louder and louder, and the police were getting ready to move in, when suddenly the shouting died down. There was complete silence. What had happened? Everyone was now looking towards the platform at the front of the hall. There, beside the Mayor, stood a short, chubby young woman.

Who was she?

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Yes it was Polly!

The silence was broken as the Mayor began to speak.

"People of Deetown," he began, "this is Polly. Many of you know her, though many will not. She is the one who gets out of bed to sweep the streets when most of us are still asleep. She has been very ill and even now she shouldn't really be here. But she tells me that she must start work again tomorrow. She has a few words she would like to say now."

Polly stepped forward. She had never spoken to a lot of people before, and she was nervous. She coughed, then began to speak.

"Ladies and gentlemen. I love this town. I was born here. It is now in a terrible mess and you are all to blame. A cigarette end dropped by an adult, or one little toffee paper dropped by a boy or girl, doesn't seem very much at the time. But you have all seen how it all piles up. Tomorrow I start sweeping again, but I need lots of help. Who will help me?"

For a moment, no-one moved. There was silence. Then a man near the front shouted, "I'll be with you."

That did the trick. Soon hands were raised all round the room and people began to make plans for a big clean-up.

It was then that everyone began to realise that Polly was a real live person, not someone you simply didn't notice as you hurried past. There she stood with twinkling eyes. She was somebody special, and everybody began to cheer.

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Next morning, an army of Deetown people got to work with Polly. It took a long time to clean up the place, but at last it was all done. The litter and other rubbish was taken away. The rats and mice moved out. And once again the flowers looked beautiful.

As if in a fairy tale, Polly lived happily ever after because everybody helped her to keep Deetown clean.

What's more, nobody ignored her when they saw her in the street. She was everybody's friend.

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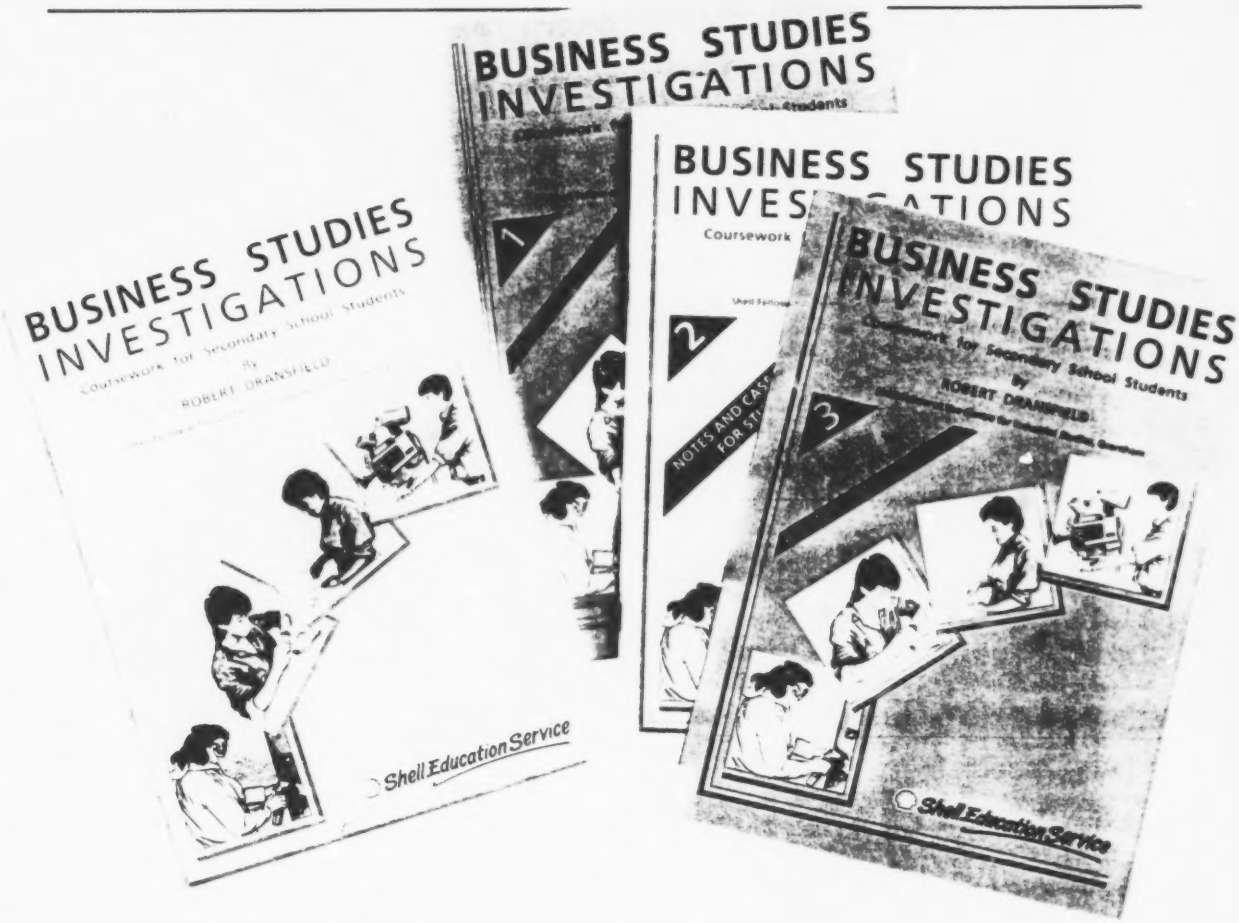

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The studies have been prepared by Robert Dransfield, a teacher on a Shell Fellowship at the Centre for Industrial Studies, Grantham. They are based on the experiences of young people in the Shell 'Livewire' Scheme and were trialled in a variety of different schools.

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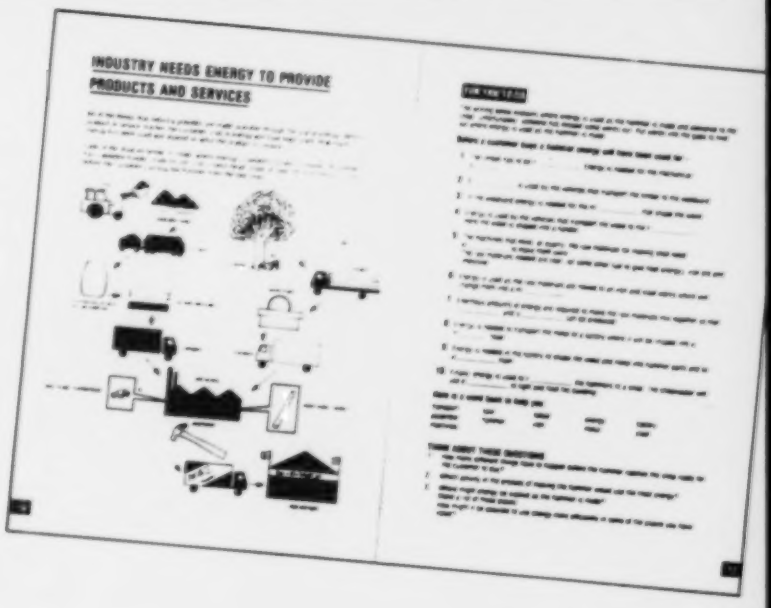

This education pack develops pupil awareness of the importance of energy for modern life and the need for it to be used efficiently. The issues investigated within the pack are contained in seven distinct UNITS which are presented in two PUPIL ACTIVITY BOOKS.

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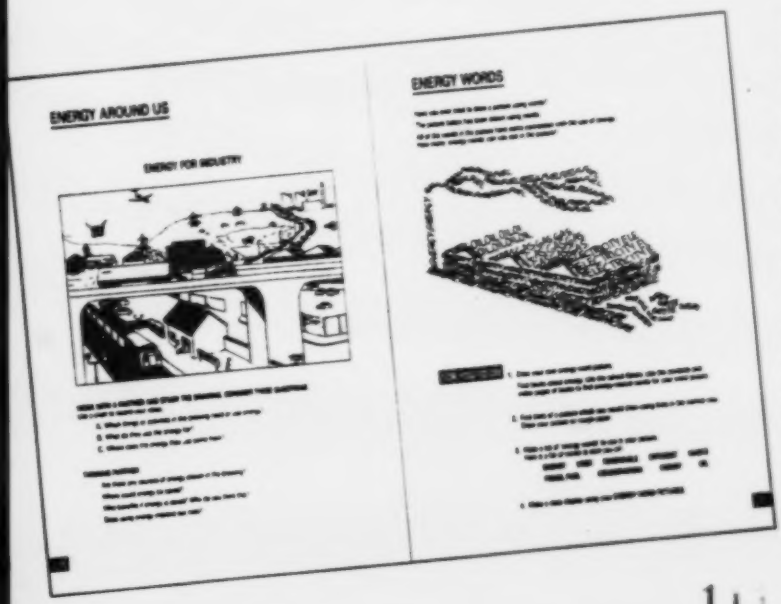

The materials and equipment required for this pack will already be available in many schools and are all easily obtainable from educational catalogues or shops.

The Exploring Energy Pack has been written by a teacher on secondment to East Midlands Electricity.

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